



TENDER NO: UGU-07-1683-2024

**REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED
INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
EFFLUENT MAIN (PHASE 1)**

CIDB CONTRACTOR GRADING: 8ME OR HIGHER

October 2024

PROCUREMENT DOCUMENT

NAME OF TENDERER:	
ADDRESS OF TENDERER	
TELEPHONE	
FAX	
TENDER SUM	
DURATION	

TENDER CLOSING DATE: 12:00, FRIDAY 29 NOVEMBER 2024

ISSUED BY:

Ugu District Municipality

PO Box 33
Port Shepstone
4240

Tel : (035) 688 3536
Email : thami.mbona@ugu.gov.za

COMPILED BY:

**DLV Project Managers and Engineers
(Pty) Ltd**

13 Ennisdale Drive
Durban North
4051

Tel : (031) 266 8345
Email : info@dlveng.co.za

SUMMARY FOR TENDER OPENING PURPOSES

(To facilitate the reading out of tender parameters at the opening of tenders, the tenderer shall complete this form and submit it with his tender)

Name of Contractor submitting the tender:

CSD NUMBER:

Tender Amount:

(as stated in the Form of Offer)

R

Alternative Tender offered:

(Yes /No)

If "Yes" state amount:

R

Time for Completion:

months

Maximum time for Completion:

12 months

Details of contact person:

Name *(Print)*:

Telephone No:

Fax No:

E-mail address *(if available)*:

(Note: In the event of conflict between the data provided in this summary and that given in the tender, the latter shall prevail.)

SIGNATURE: _____

(of person authorised to sign the tender)

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The Contract (Volume 2)			
Part C1: Agreement and Contract Data		C.1 – C.15	
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Part C2: Pricing Data		C.16 – C.113	
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The Tenderer shall also satisfy himself that this document is complete in accordance with the above contents and if any pages are found to be missing, or duplicated, shall immediately request the Engineer to rectify the discrepancy. No liability will be admitted by the Employer in respect of errors in the Tenderer's Offer due to the foregoing.

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T1 TENDERING PROCEDURES

T1.1 TENDER NOTICE AND INVITATION TO TENDER



REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 1)

CIDB CLASSIFICATION: 8ME OR HIGHER

Contract №: UGU-07-1683-2024

Ugu District Municipality invites Competent and experienced Tenderers for the Refurbishment and Upgrade Of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works And Effluent Main (Phase 1). The minimum specifications are detailed in the tender document. It is required that tenderers must have a CIDB grading of **8ME or Higher**. Joint Ventures that satisfy the minimum criteria are eligible to tender.

Tender documents will be available from the Cashier's Office at Ugu District Municipality, 28 Connor Street, Port Shepstone, 4240 during office hours (10:00 to 15:00, from Monday to Friday) from the **28th of October 2024 until 31st October 2024**. **No documents will be distributed at the tender clarification meeting**. A non-refundable document fee of **R1,000.00** payable in cash or by bank guaranteed cheque made out in favour of Ugu District Municipality is required on collection of the tender documents. Tender Documents will also be available on the Ugu District Municipality website: www.ugu.gov.za and the National Treasury's e-Tender Portal for free downloading by Tenderers as from **28th October 2024**. Bidders who download the tender document must follow the standard CIDB colour coding system when printing the document. The Municipal Offices can be contacted by telephone on (039) 688 5700.

Any queries related to technical issues within this document may be addressed to **Mr Thami Mbona from Ugu District Municipality via email at thami.mbona@ugu.gov.za or Anesh Mangray from DLV Project Managers and Engineers (Pty) Ltd via email at anesh@dlveng.co.za**.

A compulsory clarification meeting with representatives of the Employer will take place at the existing **Margate Water Treatment Works Site (30°51'4.09"S; 30°21'52.02"E)**, access via Woodstock Street, approximately 1.5km North-West of Margate Town CBD (Marine Drive) which is 14km South West of Port Shepstone, Access via Exit 33 (Uvongo/R620/Margate) Along the R61/N2, on **Friday, 1st November 2024 at 10h00**. The Employer's Agent will not be available for a site inspection on any other occasion. Tenderers are required to bring their copies of the tender document to the compulsory tender briefing and site visit for signing by the Employer. Failure to obtain a tender document prior or non-attendance of the compulsory briefing and site visit will result in disqualification of your tender.

Ugu District Municipality subscribes to the **Preferential Procurement Regulations 2022**, pertaining to the **Preferential Procurement Policy Framework Act (PPPFA) 5/2000** principles whereby a bidder's submission will be evaluated according to the sum of the award of points in respect of the tender value and Specific Goals.

Tenderers shall be evaluated for functionality before acceptance for further evaluation and consideration in terms of the price and preference points.

A minimum of 70 points must be obtained for total functionality is required. Bids scoring below 70 points will not be evaluated further. The following will form criteria used for the functionality assessment.

Functionality Criteria (Sub-criteria)	Maximum Allocated Points
Relevant experience (Tenderer)	40
Financial Resources (Bank Rating)	15
Experience of Key Personnel	30
Quality Management System	5
Preliminary Programme	5
Construction Health & Safety Plan	5
TOTAL MAXIMUM POINTS	100

Functionality, Price and Preference, **Method 2**, will be used for evaluation. The 90/10 preferential point system will be applicable, with 90 points for price and 10 points for Specific Goals / Preference (See below table), in terms of revised **Preferential Procurement Regulations 2022** in effect from **16 January 2023 Gazette Notice No. 47452** dated 04 November 2022 and to **Ugu District Municipality's Preferential Policy Framework Act Policy Number 5/21/P**, dated December 2022.

In terms of regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations 2022, preferential 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 the table below and must be supported with proof/documentation stated in the conditions of this tender.

Points to be allocated will be on the basis of the following:

	Categories	90 10
1	Ownership	5
2	Empowerment	2
3	Reconstruction & Development Programme	2
4	Other Specific Goals-	1
	Total	10
#	Specific Goal(s)	90 10 PP
	Ownership Categories :	
1	Broad Based Black Economic Empowerment:	
	1. BBBEE Level 1	5
	2. BBBEE Level 2	4
	3. BBBEE Level 3 to 8	2
2	Sub-Contracting: [Min 5% for >R5 Million] [Max 30% < R30 Million]	
	1. an EME or QSE which is at least 100% owned by black people;	2
	2. an EME or QSE which is at least 51% owned by black people;	1
	3. an EME or QSE which is at 25% - 50% owned by black people;	0.5
3	Promotion of Local Business(s)	
	1. Enterprise Located within the District Municipality - Rural	2
	2. Enterprise Located within the District Municipality - Urban	1.5
	3. Enterprise Located within the Province	0.5
4	Other Specified Goals	
	1. Enterprise 100% owned by Youth/Women/Disabled/ Military Veterans	1

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

Tenderers shall take **note** of the following tender conditions:

- *Ugu District Municipality does not bind itself to accept the lowest or any tender.*
- *No employee of the state is permitted to conduct any business whatsoever, either directly or indirectly, with the Ugu District Municipality (Regulation 44 of the Municipal Supply Chain Management regulations)*
- *Tenders submitted are to remain valid for 90 days from the closing date for submission of tenders.*

The closing time for receipt of tenders is at **12h00 on Friday, 29 November 2024**. Only tenders deposited into the official tender box by the closing time and date will be accepted.

Tenders, completed as prescribed, shall be sealed in an envelope marked "UGU-07-1683-2024, Refurbishment and Upgrade Of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works And Effluent Main (Phase 1)" and deposited in the official tender box in the foyer of **Ugu District Municipality Offices at No. 96 Marine Drive, OSLO BEACH at Phase 2 building**. The municipality will not be held responsible for any tenders delivered by courier services.

Mr. VO Mazibuko

Acting Municipal Manager

Ugu District Municipality

T1.2 TENDER DATA

1. GENERAL

The Conditions of Tender reproduced in Section 3 are the Standard Conditions of Tender as contained in Annex F of SANS 294 – *Construction Procurement Processes, Methods and Procedures* which contain references to the Tender Data for details that apply specifically to this tender.

The Tender Data shall be read with the Standard Conditions of Tender in order to expand on the Tenderer's obligations and the Employer's undertakings in administering the tender process in respect of the project under consideration.

The Tender Data contained hereafter in Section 2 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.

2. TENDER DATA APPLICABLE TO THIS TENDER

Clause Number	Description
F1.1	The Employer for this Contract is: UGU DISTRICT MUNICIPALITY
F1.2	Tender Documents <u>TENDER</u> 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 forms <u>CONTRACT</u> Part 1: Agreements and Contract Data C1.1: Form of Offer and Acceptance C1.2: Contract Data Part 2: Pricing Data C2.1: Pricing Instructions C2.2: Bill of Quantities Part 3: Scope of Work C3: Scope of Work Part 4 : Site Information C4 : Site information The Tender Document shall be obtained from the Employer or his authorized representative at the physical addresses stated in the Tender Notice, upon payment of the deposit stated in the Tender Notice.
F1.4	The Employer's agent is: Name : DLV Project Managers and Engineers (Pty) Ltd Address : 13 Ennisdale Drive, Durban North, 4051 Telephone : (031) 266 8345 Fax : (034) 983 2765 E-Mail : info@dlveng.co.za
F1.5	The Employer's right to accept or reject any tender offer The Employer is not obliged to accept the lowest or any tender offer.
F2.1	Eligibility A Tenderer will not be eligible to submit a tender if: (a) the contractor submitting the tender is under restrictions or has principals who are under restriction to participate in the Employer's procurement due to corrupt or fraudulent practices; (b) the Tenderer does not have the legal capacity to enter into the contract; (c) the contractor submitting the tender is insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended

	his business activities, or is subject to legal proceedings in respect of the foregoing; (d) The Tenderer does not comply with the legal requirements stated in the Employer's procurement policy; (e) The Tenderer cannot demonstrate that he possesses the necessary technical qualifications and competencies, financial resources, equipment and other physical facilities, managerial capability, personnel, experience and reputation to perform the contract; or (f) The Tenderer cannot provide proof that he is in good standing with respect to duties, taxes, levies and contributions required in terms of legislation applicable to the work in the contract. TENDERER'S TO TAKE PARTICULAR NOTICE OF THIS CLAUSE AS TENDERERS WHO DO NOT COMPLY HEREWITH WILL NOT BE CONSIDERED ELIGIBLE. TENDER QUALIFICATION: LABOUR INTENSIVE CONTRACTS Only those tenderers who can demonstrate that they will have in their employ, management and supervisory staff satisfying the requirements of the scope of work for labour-intensive competencies for supervisory and management staff during the validity of the contract are eligible to submit tenders. To qualify for award of the Contract, tenderers shall meet the following minimum qualifying criteria: (a) Having participated in and graduated with fully satisfactory results from the relevant national qualification framework training organized under EPWP (or other similar project) and applying trained supervisory staff on a full-time basis for the execution of the works. LIC NQF Level 5. (b) Liquid assets/or credit facilities covering the expected expenditures for two full work months (c) Proposals for timely acquisition (own, lease, hire, etc.) of the essential minimum equipment (d) The contractor will carry out the works using labour-based work methods as described in the Special Conditions of Contract The tenderer must submit to the Employer, names of all management and supervisory staff that will be employed to supervise the labour-intensive portion of the works together with satisfactory evidence that such staff members satisfy the eligibility requirement. The contractor shall ensure that the minimum supervisor to worker ratio of 1:20 for effective supervision of Labour-intensive works for all LI activities. Schedule of Labour Content The minimum Labour Content for this Project shall be 5% calculated as the amount spend on labour wage divided by the total value of the project. The minimum job creation targets on the project shall be: <table><tr><th></th><th>Total</th><th>Women</th><th>Youth</th><th>Disabled</th></tr><tr><td>Work Oppor-tunities</td><td>37</td><td>10</td><td>15</td><td>2</td></tr><tr><td>Person Days</td><td>5 920</td><td>1 600</td><td>2 400</td><td>320</td></tr><tr><td>Training Days</td><td>20</td><td>5</td><td>5</td><td>5</td></tr></table>		Total	Women	Youth	Disabled	Work Oppor-tunities	37	10	15	2	Person Days	5 920	1 600	2 400	320	Training Days	20	5	5	5
	Total	Women	Youth	Disabled																	
Work Oppor-tunities	37	10	15	2																	
Person Days	5 920	1 600	2 400	320																	
Training Days	20	5	5	5																	
F2.7	Site visit and clarification meeting The arrangements for the compulsory site inspection visit and clarification meeting are as follows:																				

	Location: As per the Tender Advert Date : As per the Tender Advert Starting time : As per the Tender Advert Enquiries and confirmation of attendance at least five full working days in advance regarding the meeting and site inspection may be directed to: <u>SCM Enquiries</u> Ugu District Municipality Ms. Ntabiso Mabaso Tel : 039 688 5906 E-Mail : ntabiso.mzoto@ugu.gov.za <u>Technical Enquiries</u> Ugu District Municipality Mr. Thami Mbona Tel : 039 688 3587 E-Mail : thami.mbona@ugu.gov.za or DLV Project Managers and Engineers (Pty) Ltd Mr. Anesh Mangray Tel : 031 266 8345 E-Mail : anesh@dlveng.co.za / info@dlveng.co.za
F2.12	Alternative Tenders If a Tenderer wishes to submit an alternative tender offer, the only criteria permitted for such an alternative tender offer are: (a) Individual items Individual items offered as alternatives to items in the Bill of Quantities will only be considered if listed and priced in Form R: <i>Amendments, Qualifications and Alternatives</i> in Part 2 of the Contract Document, accompanied by a detailed statement as necessary. (b) Alternative designs Where a Tenderer desires to submit an alternative tender involving modifications to the design or method of construction that would alter the character of the tender, the following procedure must be observed: (i) The alternative offer must be accompanied by supporting information, drawings, calculations and a priced alternative Bill of Quantities to enable its technical acceptability, construction time and price to be fully assessed. Such information, drawings and Bill of Quantities must be sufficient for the proper evaluation of the tendered alternative, otherwise the offer will not be considered. (ii) Any alternative tender involving modifications to the design will be assessed on its merits and may be accepted. An accepted alternative design will become the design for the purpose of the contract. (iii) If an alternative design with its priced Bill of Quantities has been accepted, the

	sum thus tendered for the alternative will not be subject to re-measurement and will be the final amount payable to the Contractor, except only for variations arising from: • Changes in design parameters ordered by the Engineer; • Changes not arising from any failure or fault of the Contractor, but from modifications requested by the Engineer. (iv) A decision whether or not to adopt a technically acceptable modified design will be governed by the amount of the overall saving and the advantages to the Employer which the modified design can be reliably expected to achieve. Matters to be considered in arriving at the overall saving will include the effect of any deferment in starting date arising from extra time needed for the preparation of an amended contract for signature. (v) The priced alternative Bill of Quantities must include an amount equal to 5% of the amount tendered therein to cover the Employer's costs of checking the alternative design offered.																		
F2.13	Submitting a Tender Offer																		
F2.13.5	Tender offers shall be submitted as an original only. Under no circumstances whatsoever may the tender forms be retyped or redrafted.																		
F2.13.6	A two-envelope procedure will not be followed. The Employer's address and identification details are as follows: <table><tr><td colspan="2">Location of Tender box:</td><td>Ugu District Municipality at 96 Marine Drive, Phase 2 Building, Oslo Beach.</td></tr><tr><td colspan="2">Physical address:</td><td>96 Marine Drive, Phase 2 Building, Oslo Beach, Port Shepstone, 4240</td></tr><tr><td rowspan="4">Identification details</td><td>Reference Number</td><td>UGU-07-1683-2024</td></tr><tr><td>Title of Tender</td><td>REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 1)</td></tr><tr><td>Closing Date</td><td>As per the Tender Advert</td></tr><tr><td>Time</td><td>As per the Tender Advert</td></tr><tr><td colspan="2">Postal address:</td><td>PO Box 33, Port Shepstone, 4240</td></tr></table>	Location of Tender box:		Ugu District Municipality at 96 Marine Drive, Phase 2 Building, Oslo Beach.	Physical address:		96 Marine Drive, Phase 2 Building, Oslo Beach, Port Shepstone, 4240	Identification details	Reference Number	UGU-07-1683-2024	Title of Tender	REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 1)	Closing Date	As per the Tender Advert	Time	As per the Tender Advert	Postal address:		PO Box 33, Port Shepstone, 4240
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	Closing Date	As per the Tender Advert																	
	Time	As per the Tender Advert																	
Postal address:		PO Box 33, Port Shepstone, 4240																	
F2.15	Closing Time The closing time for submission of Tender Offers is as per the advert. Telephonic, telegraphic, facsimile, telex, electronic or e-mailed tenders will not be accepted.																		
F2.16	Tender Validity All tenders shall remain valid for a period of ninety (90) days after the time and date set for the opening of tenders, or until the Tenderer is relieved of this obligation by the Employer, in writing, at an earlier date. However, the Tenderer may be requested in writing, not later than fourteen (14) days before this validity period will lapse, to extend the validity of this tender for a specific period. The written approval of the Tenderer must then be received before the lapsing of the original validity period, in order to remain valid. Should a Tenderer – • Withdraw his tender during the period of its validity; or • give notice of his inability to execute the contract or fail to execute the contract; or																		

	- fail to sign the contract agreement or furnish the required security within the period fixed in the Contract Data or any extended time agreed to by the Employer; then he shall be liable for and pay to the Employer – - all expenses incurred in calling for fresh tenders, if it should be necessary; - the difference between his tender and any less favorable tender accepted either by fresh tenders being called or by another tender being accepted from those already received; - any escalation of the final contract price resulting from any delay caused in calling for fresh tenders; Provided always that the Employer may exempt a Tenderer from the provisions here of, if it is of the opinion that the circumstances justify such exemption.
F2.19	Access Access shall be provided for inspections and testing by personnel acting on behalf of the Employer.
F2.22	Return of Tender Documents Not applicable.
F2.23	Certificates The following certificates must be provided with the tender: - Original, Valid Tax Clearance Certificate and Tax reference number, Request reference number and PIN obtained from SARS. - A certified copy of B-BBEE Verification Certificate from a Verification Agency accredited by the South African Accreditation System (SANAS) or Sworn Affidavit confirming annual turnover and level of black ownership and in case of all EMEs and QSEs with 51% black ownership or more - National Treasury Central Supplier Database Compliance Information (CSD), containing registration confirmation status of National Treasury with MAAA" supplier reference number. - Joint Venture Agreement and Power of Attorney in case of Joint Ventures; - VAT Registration Certificate from the South African Revenue Services (SARS); - Company / CC / Trust / Partnership registration certificates; - Proof that payment for municipal services is up to date not more than 30 days; and - Certified Copies of Identity Document in the case of one-man concerns
F3.4	Opening of Tender Submissions The time, date and location for the opening of the tender offers is as follows: Time: As per the Tender Advert Date: As per the Tender Advert Location / Venue: As per the Tender Advert
F3.5	The two-envelope system <u>will not</u> apply to this tender
F3.11	Evaluation of Tender Offers
F3.11.1	The Ugu District Municipality has adopted a policy in supporting the legislation applicable to procurement of tenders and management of Construction Contracts. To achieve the RDP principles, an environment conducive to emerging and SMME's Contractors has to be created. Therefore,

F3.11.2	the procurement policy adopted by Ugu District Municipality will be implemented in this contract to give effect to Section 217(2) of the Constitution and as published in Government Gazette no 16085, dated 23 November 1994. Tenders will be evaluated in two stages in accordance with the standard tender evaluation Method 2: Financial Offer and Preferences as follows: STAGE 1: TEST FOR RESPONSIVENESS/ELIGIBILITY In order for a tender to be considered responsive, it must comply with ALL of the following criteria: (a) The tender documentation must be completed and signed in all respects; The Contractor must have the required CIDB grading; (b) The tender documentation must include all necessary and applicable documentation as listed in F2.23 above; and (c) The tender must comply with the eligibility criteria noted in F2.1; and In terms of F2.1(e), the following specific criteria must be proven by the tenderer: i) That the tenderer possesses the necessary on-site, management expertise and capability to carry out the contract ii) That the tenderer has the financial capacity to carry out the contract; and iii) That the tenderer has ready access to the plant and equipment required to carry out the contract The responsiveness of a tender will be assessed by scoring the bid according to the criteria detailed in the table overleaf. It is incumbent on the Tenderer to ensure that the returnable documents in T2 are completed in sufficient detail to enable the score to be properly assessed. If the information provided renders a specific criterion not being fully complied with, then the bid will be scored on the next criterion down. TENDERER'S MUST SCORE A MINIMUM OF 70 POINTS TOTAL FOR THE BID TO BE ELIGIBLE IN TERMS OF F2.1 (e).
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SCORING FUNCTIONALITY					
Reference Page	Criterion	Assessment	Points Awarded	Portfolio of evidence	Max Score
T.67-74: P: Key Personnel & Q: Curriculum Vitae Format of Key Personnel	Experience of Key Personnel	Project Manager with minimum NQF Level 7 Degree in Civil Engineering/Project Management with +10 years experience in Wastewater / Water Treatment Plant projects, Professionally. Registered with ECSA/SACPCMP (Pr.Eng / Pr.Tech.Eng / Pr. CMP) +10 years experience – 15 points 7-10 years experience – 10 points 5-6 years experience – 5 points Less than 5 – 0 Points	15	Certified Copy of Degree/certificates and signed curriculum vitae (CV) including contactable referees.	30
		Site Agent / Resident Engineer with minimum NQF Level 6 Diploma in Civil Engineering/Project Management with +10 years experience in Wastewater / Water Treatment Plant projects. Registered or Eligible to Register with ECSA/SACPCMP (Pr.Eng / Pr.Tech.Eng / Pr. CMP) +10 years experience – 10 points 7-10 years experience – 8 points 5-6 years experience – 6 points Less than 5 – 0 Points	10	Certified Copy of Degree/certificates and signed curriculum vitae (CV) including contactable referees.	
		Forman with minimum NQF Level 4 Matriculation (National Senior Certificate) with +10 years experience in Wastewater / Water Treatment Plant projects.(N3 Certified -Trade Test, Wiremans Licence) +10 years experience – 5 points 5-10 years experience – 3 points Less than 5 – 0 Points	5	Certified Copy of Degree/certificates and signed curriculum vitae (CV) including contactable referees.	

	T65-66: O:Sched- ule Of The Tenderer's Experience	Specific tar- geted ex- perience in Wastewater Treatment Plant / San- itation pro- jects within the last 10 years	The contractor has been appointed and successfully completed at least 5 projects concerning Water Treatment Plant / Bulk Sanitation Pipeline projects priced at > R30 million within the last 10 years.	40	Appointment let- ters and Com- pletion Certifi- cates	40
			The contractor has been appointed and successfully completed at least 4 projects concerning Water Treatment Plant / Bulk Sanitation Pipeline projects priced at > R30 million within the last 10 years.	32	Appointment let- ters and Com- pletion Certifi- cates	
			The contractor has been appointed and successfully completed at least 3 projects concerning Water Treatment Plant / Bulk Sanitation Pipeline projects priced at > R30 million within the last 10 years.	24	Appointment let- ters and Com- pletion Certifi- cates	
			The contractor has been appointed and successfully completed at least 2 projects concerning Water Treatment Plant / Bulk Sanitation Pipeline projects priced at > R30 million within the last 10 years.	16	Appointment let- ters and Com- pletion Certifi- cates	
			The contractor has been appointed and successfully completed at least 1 project concerning Water Treatment Plant / Bulk Sanitation Pipeline projects priced at > R30 million within the last 10 years.	8	Appointment let- ter and Comple- tion Certificates	
			All other experience.	0	Appointment let- ter or Comple- tion certificate only	

	T.103: AE: Quality Management System	Quality Assurance and Quality & Environmental Management	Fully certified ISO 9001:2015 Quality Management System in respect of Construction Management within the Built Environment	5	Certified and valid copy of ISO 9001:2015 Certificate	5
			Internal/ Uncertified Quality Management System in respect of Construction Management within the Built Environment. Well detailed and indicates all activities required clearly.	2	Copy of Quality Management System	
			Internal/ Uncertified Quality Management System in respect of Construction Management within the Built Environment. QMS provided limited information and is ambiguous / No QMS System	0	Copy of Quality Management System	
	T:77 T: Provisional Programme	Preliminary Programme of Works	Well detailed and indicates all activities required to execute the works by the tenderer, including realistic task timelines, task dependencies and critical path	5	Provisional Programme on MS Projects or similar project management software	5
			Not adequately detailed and indicates some activities to execute the works by the tenderer including task time-lines, task dependencies and critical path	2	Provisional Programme on MS Projects or similar project management software	
			Not Supplied	0		
	T:63-64 M: Banking Details & N: Declaration of Financial Capacity	Financial Rating	Provision of bank rating or bank guarantee indicating financial stability and Bank Credit Facility of a minimum of R 15 000 000.00.	15	Current Bank Rating Letter	15
			Provision of bank rating or guarantee indicating financial stability or Bank Credit Facility of a minimum of R10 000 000.00.	5		
			Provision of bank rating or guarantee indicating financial stability or Bank Credit Facility Less than R10 000 000.00 or No bank guarantee or credit facility	0		

	T 74 & T.87: AA: Health and Safety Plan	Health and Safety Plan	Well detailed and indicates all health and safety activities required to execute the works compiled by Safety Officer, from Key Personnel on Page T59, and submitted by the tenderer	5	Health and Safety Plan	5
			Not adequately detailed and indicates some health and safety activities to execute the works compiled by Safety Officer, from Key Personnel on Page T59, and submitted by the tenderer	2	Health and Safety Plan	
			Not Supplied	0		
		MAXIMUM SCORE:				

F3.11.3 STAGE 2: FINANCIAL OFFER AND PREFERENCES

All tenders that meet the stage 1 criteria for responsiveness will progress through to the evaluation phase as set out in Returnable F (MBD 5).

F3.11.4 **Points scored for price (Contract Value more than R 50 000 000)**

The 90/10 preference point system will be used to allocate points for tenders in this category.

Points scored for price (Contract Value less than R 50 000 000)

The 80/20 preference point system will be used to allocate points for tenders in this category.

It is estimated that tenders on this contract will be evaluated on the 90/10 preference point system.

Financial Offer

The financial offer will be scored using the following formula.

$$Nf = W1 \times [1 - (P - P_m) / P_m]$$
where:
W1 = 80 for financial values up to R50 000 000 (inclusive of VAT) of all responsive tenders received, and 90 for financial values over R50 000 000;
Pm = the value of the comparative offer of the most favourable tender;
P = the value of the comparative offer under consideration

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 specific goals as determined by Ugu District Municipality. For this tender the preference points will be allocated as follows

Specific Goals		Maximum score	
		80/20	90/10
1	Specific Goals (Broad Based Black Economic Empowerment Contribution)	10	5
2	SMME Empowerment	4	2
3	Reconstruction and Development Programme – Promotion of Local Businesses	4	2
4	Enterprise Ownership by targeted designated groups (youths/disabled/women/war veterans)	2	1
TOTAL POINTS		20	10

Specific Goals

For Specific Goals, the Broad Based Black Economic Empowerment Contribution will be utilised and points will be allocated to a maximum of 10/ 5 for the as follows:

BBBEE Level	Points		Portfolio of Evidence
	80/20	90/10	
1	10	5	Valid and Certified BBBEE Certificate or Sworn Affidavit
2	4	8	
3-8	2	4	
9 and above	Nil	Nil	

Tenderers will be required to submit a sworn affidavit or BBBEE Verification Certificate as detailed in the Returnables.

Small, Medium and Micro Enterprise (SMME) Empowerment

For this contract, it has been determined that up to 30% of the tendered contract value can be subcontracted to SMME's. Points will be allocated on the basis of maximum points possible, proportioned on the class of SMME, value of work to be subcontracted and the maximum points attainable.

Points for SMME Empowerment will be awarded as follows:

$$\text{Points (SMME Empowerment)} = f_1 \times f_2 \times S_c$$

Note:

- The maximum points for subcontracting to an SMME will be S_c , based on the price/preference points as follows:

Description	Price Preference	
	80/20	90/10
S_c	4	2

- If the tendered contract amount (excluding provisional sums, contingencies, escalation and VAT) is C , the work agreed to be subcontracted is valued at S , the factor based on value of subcontracted $f_1 = S/(0.3 \times C)$. The maximum value of f_1 is 1.

3. The factor f_2 for the class of SMME will be determined as follows:

Description/ classification of SMME		Factor, f_2	Number of points		Portfolio of Evidence
			80/20	90/10	
1	An EME or QSE which is 100% owned by black people.	100%	4	2	Company registration certificate (CK Document), sworn affidavit and audited financial statements (as appropriate)
2	An EME or QSE which is at least 51% owned by black people.	50%	2	1	
3	An EME or QSE which is 25% - 50% owned by black people.	25%	1	0.5	
4	An EME or QSE which is less than 25% owned by black people.	0%	Nil	Nil	

Promotion of Local Business

Preference will be given to tenderers who are locally based, as follows:

Description		Price Preference		Portfolio of Evidence
		80/20	90/10	
1	Enterprise Located within the District Municipality - Rural	4	2	Municipal rates or copy of signed lease agreement or confirmation letter from Ward Councillor
2	Enterprise Located within the District Municipality - Urban	3	1.5	
3	Enterprise Located within the Province	1	0.5	

Other Specific Goals

Should the tendering enterprise, be owned 100% by the youth, women, disabled and military war veterans, a further preference points will be awarded as follows:

Price Preference		Portfolio of Evidence
80/20	90/10	
2	1	Company registration certificate (CK Document) and ID copies of members ID's/medical certificate/ confirmation from WVA

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 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) Tenderer's Health and Safety Declaration of Compliance with the Occupational Health and Safety Act No 85 of 1993 and the Construction Regulations 2003, is signed by an authorized person. h) 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; i) the tender offer is signed by a person authorized to sign on behalf of the Tenderer; j) a Tenderer who submitted a tender as a Joint Venture has included an acceptable Joint Venture Agreement with his tender. k) the tenderer has completed the schedule of quantities in full. Items against which no price is entered are to be considered as incomplete and invalidate the tender. Items against which N/A, left blank or – (dash) is entered are to be considered as incomplete and will also invalidate the tender. Items against which Nil or zero (0) is entered are to be considered to be fully priced and the tenderer will provide the items in questions as specified at zero (0) or Nil price. l) A Tenderer HAS NOT grouped a number of items together and provided one tender sum for such group of items.
F.3.18	The number of paper copies of the signed contract to be provided by the Employer is one original plus one original duplicate.
	The additional conditions of tender are as follows: 1. The BBBEE Certificate from an accredited organisation or sworn SMME affidavit 2. Proof of address in the form of Municipal Rates Invoice or copy of signed lease agreement or original stamped letter from Ward Councillor.

Annex F: Standard Conditions of Tender

(As contained in Annexure F of Board Notice 12 of 2009: Standards for Uniformity in Construction Procurement)

F1 General

F1.1 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 F2 and F3, 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 conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

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

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

F1.1.3 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.

F1.2 Tender Documents

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

F1.3 Interpretation

F1.3.1 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.

F1.3.2 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.

F1.3.3 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 interests which make it difficult to fulfil his or her duties impartially;
- ii) an individual or organisation is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
- iii) incompatibility or contradictory interests exist between an employee and the organisation which employs that employee

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

F1.4 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.

F1.5 The employer's right to accept or reject any tender offer

F1.5.1 The employer may accept or reject any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The employer shall not accept or incur any liability to a tenderer for such cancellation and rejection but will give written reasons for such action upon written request to do so.

F1.5.2 The employer may not subsequent to the cancellation or abandonment of a tender process or the rejection of all responsive tender 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.

F1.6 Procurement procedures

F1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to F3.13, be concluded with the tenderer who in terms of F3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submission that are received at the closing time for tenders.

F1.6.2 Competitive negotiation procedure

F1.6.2.1 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 F3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of F3.8 relating to the material deviations or qualifications which affect the competitive position of tenders shall not apply.

F1.6.2.2 All responsive tenderers, or not less than three responsive tenderers that are highest ranked in terms of the evaluation method and evaluation criteria stated in the tender data, shall be invited in each round to enter into competitive negotiations, based on the principle of equal treatment and keeping confidential the proposed solutions and associated information. Notwithstanding the provisions of F2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

F1.6.2.3 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.

F1.6.2.4 The contract shall be awarded in accordance with the provisions of F3.11 and F3.13 after tenderers have been requested to submit their best and final offer.

F1.6.3 Proposal procedure using the two stage-system

F1.6.3.1 Option 1

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

F1.6.3.2 Option 2

F1.6.3.2.1 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.

F1.6.3.2.2 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.

F2 Tenderer's obligations

F2.1 Eligibility

F2.1.1 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.

F2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

F2.2 Cost of tendering

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

F2.3 Check documents

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

F2.4 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.

F2.5 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.

F2.6 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.

F2.7 Clarification meeting

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

F2.8 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.

F2.9 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.

F2.10 Pricing the tender offer

F2.10.1 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.

F2.10.3 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.

F2.10.4 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.

F2.11 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.

F2.12 Alternative tender offers

F2.12.1 Unless stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

F2.12.2 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.

F2.13 Submitting a tender offer

F2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works, services or supply identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

F2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

F2.13.3 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.

F2.13.4 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.

F2.13.5 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.

F2.13.6 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.

F2.13.7 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.

F2.13.8 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.

F2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

F2.14 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.

F2.15 Closing time

F2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

F2.15.2 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.

F2.16 Tender offer validity

F2.16.1 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.

F2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

F2.16.3 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.

F2.16.4 Where a tender submission is to be substituted, submit a substitute tender in accordance with the requirements of F2.13 with packages clearly marked as "SUBSTITUTE".

F2.17 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 total of the prices or substance of the tender offer is sought, offered, or permitted.

Note: Sub-clause F2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.

F2.18 Provide other material

F2.18.1 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.

F2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

F2.19 Inspections, tests and analysis

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

F2.20 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.

F2.21 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.

F2.22 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.

F2.23 Certificates

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

F3 The Employer's undertakings**F3.1 Respond to requests from the tenderer**

F3.1.1 Unless otherwise stated in the tender data, respond to a request for clarification received up to five working days before the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.

F3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to pre-qualify 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 pre-qualified in the first instance, either as individual firms or as another joint venture; or
- c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

F3.2 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 three days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who drew documents.

F3.3 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.

F3.4 Opening of tender submissions

F3.4.1 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.

F3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, preferences claimed and time for completion, if any, for the main tender offer only.

F3.4.3 Make available the record outlined in F3.4.2 to all interested persons upon request.

F3.5 Two-envelope system

F3.5.1 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.

F3.5.2 Evaluate the quality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the quality evaluation more than the minimum number of points for quality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any preferences claimed. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for quality.

F3.6 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.

F3.7 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.

F3.8 Test for responsiveness

F3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

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

F3.8.2 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:

- (d) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- (e) significantly change the Employer's or the tenderer's risks and responsibilities under the contract, or
- (f) 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.

F3.9 Arithmetical errors, omissions or discrepancies

F3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

F3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with F3.11 for:

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

F3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

F3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

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

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.

F3.10 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.

F3.11 Evaluation of tender offers

F3.11.1 General

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

F3.11.2 Method 1: Financial offer

In the case of a financial offer:

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

F3.11.3 Method 2: Functionality/Eligibility, Financial offer and preference

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

- a) Score functionality, rejecting all tender offers that fail to achieve the minimum number of points for functionality as stated in the Tender Data.
- b) No tender must be regarded as an acceptable tender if it fails to achieve the minimum qualifying score for functionality as indicated in the tender invitation.
- c) Tenders that have achieved the minimum qualification score for functionality must be

evaluated further in terms of the preference points system prescribed in paragraphs 4 and 5 below.

The 80/20 preference point system for acquisition of services, works or goods up to Rand value of R50 million

4) (a)(i) The following formula must be used to calculate the points for price in respect of tenders (including price quotation) with a rand value equal to, or above R 30 000 and up to Rand value of R 50 000 000 (all applicable taxes included):

$$P_s = 80 \times \left(1 - \frac{(P_t - P_{min})}{P_{min}}\right)$$

Where;

P_s = Points scored for comparative price of tender or offer under consideration;

P_t = Comparative price of tender or offer under consideration; and

P_{min} = Comparative price of lowest acceptable tender or offer.

(4)(a)(ii) An employer of state may apply the formula in paragraph (i) for price quotations with a value less than R30 000, if and when appropriate:

(4)(b) Subject to subparagraph(4)(c), points must be awarded to a tender for attaining the B-BBEE status level of contributor in accordance with the table below:

Specific Goals Allocated Points in Terms of this Tender	Maximum Allocated Points (80/20 System)	Portfolio of Evidence
Ownership:		BBBEE Certificate
BBBEE Level 1	10	
BBBEE Level 2	8	
BBBEE Level 3 to Level 8	4	
Empowerment:		
1. An EME or QSE which is 100% owned by black people	4	
2. An EME or QSE which is at least 51% owned by black people	2	
3. An EME or QSE which is 25%-50% owned by black people	1	
RDP:		
1. Enterprise located within the District Municipality - Rural	4	
2. Enterprise located within the District Municipality - Urban	3	
3. Enterprise located within the Province	1	
Other Specific Goal		
1. Enterprise 100% owned by Youth/Women/Disabled/Military Veteran	2	

4)(c) A maximum of 20 points may be allocated in accordance with subparagraph (4)(b)

(4)(d) The points scored by tender in respect of B-BBEE contribution contemplated in contemplated in subparagraph (4) (b) must be added to the points scored for price as calculated in accordance with subparagraph (4)(a).

The 90/ 10 preference points system for acquisition of services, works or goods with a Rand value above R 50 million

(5)(a) The following formula must be used to calculate the points for price in respect of tenders with a Rand value above R50 000 000 (all applicable taxes included):

$$P_s = 90 \times \left(1 - \frac{(P_t - P_{min})}{P_{min}}\right)$$

Where:

Ps = Points scored for comparative price of tender or offer under consideration;
 Pt = Comparative price of tender or offer under consideration; and
 Pmin = Comparative price of lowest acceptable tender or offer.

(5)(b) Subject to subparagraph(5)(c), points must be awarded to a tender for attaining the B-BBEE status level of contributor in accordance with the table below:

Specific Goals Allocated Points in Terms of this Tender	Maximum Allocated Points (90/10 System)	Portfolio of Evidence
Ownership:		BBBEE Certificate
BBBEE Level 1	5	
BBBEE Level 2	4	
BBBEE Level 3 to Level 8	2	
Empowerment:		
4. An EME or QSE which is 100% owned by black people	2	
5. An EME or QSE which is at least 51% owned by black people	1	
6. An EME or QSE which is 25%-50% owned by black people	0.5	
RDP:		
4. Enterprise located within the District Municipality - Rural	2	
5. Enterprise located within the District Municipality - Urban	1.5	
6. Enterprise located within the Province	0.5	
Other Specific Goal		
2. Enterprise 100% owned by Youth/Women/Disabled/Military Veteran	1	

(5)(c) A maximum of 10 points may be allocated in accordance with subparagraph

(5)(d) The points scored by tender in respect of B-BBEE contribution contemplated in subparagraph (5) (b) must be added to the points scored for price as calculated in accordance with subparagraph (5)(a).

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

F3.11.4 Method 3: Financial offer and quality

In the case of a financial offer and quality:

- a) Score each tender in respect of the financial offer made and the quality offered in accordance with the provisions of F3.11.7 and F3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any
- b) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula:

$$T_{EV} = N_{FO} + N_Q$$

Where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F3.11.7;
 N_Q is the number of tender evaluation points awarded for quality offered in accordance with F3.11.9.

- c) Rank tender offers from the highest number of evaluation points to the lowest.
- d) Recommend the tenderer with the highest number of tender evaluation points for the award

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

F3.11.5 Method 4: Financial offer, quality and preferences

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

- a) Score each tender in respect of the financial offer made and the quality offered in accordance with the provisions of F3.11.7 and F3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any
- b) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula:

$$T_{EV} = N_{FO} + N_P + N_Q$$

Where:

- N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F3.11.7;
- N_P is the number of tender evaluation points awarded for preference claimed in accordance with F3.11.8.
- N_Q is the number of tender evaluation points awarded for quality offered in accordance with F3.11.9.

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

F3.11.6 Decimal places

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

F3.11.7 Scoring Financial Offers

Score the financial offers 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 the financial offer.
- W_1 is the maximum possible number of tender evaluation points awarded for the financial offer as stated in the Tender Data.
- A is a number calculated using the formula and option described in Table F1 as stated in the Tender Data.

Table F1: Formulae for calculating the value of A

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

2	Lowest price or percentage commission / fee	$A = (1 - \frac{(P - P_m)}{P_m})$	$A = P_m / P$
^a P_m is the comparative offer of the most favourable comparative offer. P is the comparative offer of the tender offer under consideration.			

F3.11.8 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.

F3.12 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.

F3.13 Acceptance of tender offer

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

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

F3.14 Prepare contract documents

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

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

F3.15 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.

F3.16 Notice to unsuccessful tenderers

- F3.16.1** 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.

F3.16.2 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.

F3.17 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.

F3.18 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.

F3.19.8 Records of such disclosed information must be retained for audit purposes.

F4. 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:

F4.1 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:***

F4.1.1 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:

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

F4.1.2 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:

- (a) 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.
- (b) Summary of monthly attendance.

F4.1.3 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:

- (a) 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,

- (b) 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.

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:

- (a) Number of work opportunities created (where one work opportunity = paid work created for one individual on an EPWP project, for any period of time).
- (b) 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 obtained by summing the total number of person-days worked by each individual employed during the course of that EPWP project.

- (c) 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.
- (d) 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).
- (e) 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).

T2 Returnable Documents

T2.1 List of Returnable Documents

The Tenderer must complete the following returnable documents:

1 Returnable documents required for tender evaluation purposes only:

REF	DESCRIPTION	PAGE
A	Certificate Of Attendance at Clarification Meeting	T.40
B	Record of Addenda to Tender Documents	T.41
C	Certificate of Authority of an Entity	T.42– T.46
D	Registration Certificates of an Entity	T.47
E	CIDB Registration	T.48
F	BBBEE Certificate	T.49
G	Bidder's questionnaire (MBD1)	T.50 – T.51
H	Declaration of Interest (MBD 4)	T.52 – T.53
I	Declaration for Procurement above R10 mil (MBD 5)	T.54 – T.55
J	Preference Points Claim Form (MBD 6.1)	T.56 - T.60
K	Affidavit Of Good Standing That Will Be Incorporated into The Contract	T.61
L	Schedule Of All Work Provided For An Organ Of The State Over The Last Five Years	T.62
M	Banking Details	T.63
N	Declaration of Financial Capacity	T.64
O	Schedule of Tenderer's Experience	T.65 – T.66
P	Key Personnel	T.67
Q	Curriculum Vitae Format of Key Personnel	T.68 – T.74
R	Schedule of Plant and Equipment	T.75
S	Schedule of Proposed Sub-Contractors	T.76
T	Provisional Programme	T.77
U	Schedule of labour content	T.78
V	Training schedule	T.79
W	Amendments, Qualifications and Alternatives	T.80 – T.81
X	Copy Workmen's Compensation Registration Certificate (or proof of payment of contributions in terms of the Compensation for Occupational Injuries and Disease Act No. 130 of 1993)	T.82
Y	Tax Clearance Certificate	T.83
Z	Declaration of Payment of Municipal Services	T.84
Z1	Affidavit Of Tenderer That Does Not Have A Municipal Rates Account But Is Working From A Residential Address Or In An Area Where Payment For Municipal Services Is Not Applicable	T.85
Z2	Declaration Of Tenderer Who Does Not Have a Municipal Rates Account But Is Renting Or Leasing An Office	T.86

2 Other documents that will be incorporated into the contract:

AA	Contractor's Health and Safety Declaration	T.87
AB	National Treasury's Central Supplier database	T.88
AC	Proforma Forms to Be Completed By Successful Tenderer	T.89 – T.101
AD	Declaration of Solvency or Liquidation	T.102
AE	Quality Management System	T.103

3 The offer portion of the C1.1 Offer and Acceptance

4 C1.2 Contract Data (Part 2)

5 C2.2 Bills of quantities

A: CERTIFICATE OF ATTENDANCE AT CLARIFICATION MEETING

This is to certify that (*Tenderer*)

of (*address*).....

..... was represented by the person(s)
named below at the compulsory meeting held for all tenderers

We acknowledge that the purpose of the meeting was to acquaint myself / ourselves with the site of the works and / or matters incidental to doing the work specified in the tender documents in order for me / us to take account of everything necessary when compiling our rates and prices included in the tender.

Particulars of person(s) attending the meeting:

Name: Signature:

Capacity:

Name: Signature:

Capacity:

Attendance of the above person(s) at the meeting is confirmed by the Employer's representative,
namely:

Name: Signature:

Capacity: Date and Time:

B: RECORD OF ADDENDA TO TENDER DOCUMENTS

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

ADD. No.	DATE	TITLE OR DETAILS
1		
2		
3		
4		
5		

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

DATE:

C: CERTIFICATE OF AUTHORITY OF AN ENTITY

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.

(I) Company	(II) Close Corpora- tion	(III) Partnership	(IV) Joint Venture	(V) Sole Proprietor

(I) CERTIFICATE FOR COMPANY

I, chairperson of the Board of Directors of
, hereby confirm by resolution of the Board
 (copy attached) taken on 20....., that
 Mr/Ms acting in the capacity of
 was authorised to sign all documents
 in connection with this tender and any contract resulting from it on behalf of the company.

Signature of Chairman:

Signature of Signatory:

As Witnesses:

1.....
 Signature Name in Block Letters

2.....
 Signature Name in Block Letters

Date:

(II) CERTIFICATE FOR CLOSE CORPORATION

We, the undersigned, being the key members in the business trading as
.....hereby authorise Mr/Ms
acting in the capacity of, to sign all documents
in connection with the tender for Contract No and any contract resulting from it
on our behalf.

Signature of Signatory:

As Witnesses:

1.....

SignatureName in Block Letters

2.....

SignatureName in Block Letters

Date:

NAME	ADDRESS	SIGNATURE	DATE

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

(III) 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 the tender for Contract No and any contract resulting from it on our behalf.

Signature of Signatory:

As Witnesses:

- 1.....

Signature

Name in Block Letters
- 2.....

Signature

Name in Block Letters

Date:

NAME	ADDRESS	SIGNATURE	DATE

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

(IV) CERTIFICATE FOR JOINT VENTURE

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

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

Signature of Signatory:

As Witnesses:

1.....

Signature

Name in Block Letters

2.....

Signature

Name in Block Letters

Date:

NAME OF FIRM	ADDRESS	AUTHORISING SIGNATURE, NAME AND CAPACITY
Lead partner		

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

(V) CERTIFICATE FOR SOLE PROPRIETOR

I....., hereby confirm that I am the sole owner of the
business trading as.....

Signature of Sole owner:

As Witnesses:

1.....	
Signature	Name in Block Letters

2.....	
Signature	Name in Block Letters

Date:

D: REGISTRATION CERTIFICATES OF AN ENTITY

ENTITY REGISTRATION:

[Important note to Tenderer: Registration Certificates for Companies, Close Corporations and Partnerships and ID documents for Sole Proprietors, must be inserted here. In the case of a Joint Venture, a copy of a duly signed Joint Venture Agreement clearly setting out the roles and responsibilities of the parties must be included with particular reference to the guarantees required in terms of the Contract Data. The Joint Venture Agreement must also clearly indicate how payment is to be affected to the entity and distributed to the parties]

E: CIDB REGISTRATION

Tenderer's must also indicate their CIDB registration details in the space provided.
(If not registered, attach proof that the enterprise can be registered with the CIDB within 10 days)

Registered Name	Registration Number

F: BBEE CERTIFICATION:

The Tenderer must also attach hereto a certified copy of their B-BBEE Verification Certificate from a Verification Agency accredited by the South African Accreditation System (SANAS), or a sworn affidavit confirming annual turnover and level of black ownership in case of all EMEs and QSEs.

G: BIDDER'S QUESTIONNAIRE – MBD 1**PART A
INVITATION TO BID**

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE UGU DISTRICT MUNICIPALITY					
BID NUMBER:	UGU-07-1683-2024	CLOSING DATE:	29 November 2024	CLOSING TIME:	12H00
DESCRIPTION					
THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (MBD7).					
BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT (STREET ADDRESS					
UGU DISTRICT MUNICIPALITY,					
96 Marine Drive, Phase 2 Building, Oslo Beach					
Port Shepstone,					
4240					
SUPPLIER INFORMATION					
NAME OF BIDDER					
POSTAL ADDRESS					
STREET ADDRESS					
TELEPHONE NUMBER	CODE		NUMBER		
CELLPHONE NUMBER					
FACSIMILE NUMBER	CODE		NUMBER		
E-MAIL ADDRESS					
VAT REGISTRATION NUMBER					
TAX COMPLIANCE STATUS	TCS PIN:		AND	CSD No:	
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE [TICK APPLICABLE BOX]	☐ Yes ☐ No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT ☐ Yes ☐ No		
[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSEs) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]					
ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐ Yes ☐ No [IF YES ENCLOSE PROOF]		ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED? ☐ Yes ☐ No [IF YES, ANSWER PART B:3]		
TOTAL NUMBER OF ITEMS OFFERED			TOTAL BID PRICE		R
SIGNATURE OF BIDDER			DATE		
CAPACITY UNDER WHICH THIS BID IS SIGNED					
BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO:			TECHNICAL INFORMATION MAY BE DIRECTED TO:		
DEPARTMENT	SCM UNIT		CONTACT PERSON	Thami Mbona	
CONTACT PERSON	Ms N Mabaso		TELEPHONE NUMBER	039-688 3587	
TELEPHONE NUMBER	039-688 5906		FACSIMILE NUMBER	N/A	
FACSIMILE NUMBER	N/A		E-MAIL ADDRESS	thami.mbona@ugu.gov.za	
E-MAIL ADDRESS	Ntabiso.Mzoto@ugu.gov.za				

PART B

TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:										
1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION. 1.2. ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED– (NOT TO BE RE-TYPED) OR ONLINE 1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2022, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.										
2. TAX COMPLIANCE REQUIREMENTS										
2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS. 2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYER'S PROFILE AND TAX STATUS. 2.3 APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION, TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA. 2.4 FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PART B.3. 2.5 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID. 2.6 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED; EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER. 2.7 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.										
3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS										
<table style="width: 100%; border: none;"> <tr> <td style="width: 70%;">3.1. IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?</td> <td style="width: 30%; text-align: right;">☐ YES ☐ NO</td> </tr> <tr> <td>3.2. DOES THE ENTITY HAVE A BRANCH IN THE RSA?</td> <td style="text-align: right;">☐ YES ☐ NO</td> </tr> <tr> <td>3.3. DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?</td> <td style="text-align: right;">☐ YES ☐ NO</td> </tr> <tr> <td>3.4. DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?</td> <td style="text-align: right;">☐ YES ☐ NO</td> </tr> <tr> <td>3.5. IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?</td> <td style="text-align: right;">☐ YES ☐ NO</td> </tr> </table> IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 ABOVE.	3.1. IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO	3.2. DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO	3.3. DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO	3.4. DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO	3.5. IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO
3.1. IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO									
3.2. DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO									
3.3. DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO									
3.4. DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO									
3.5. IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO									

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

SIGNATURE OF BIDDER:

CAPACITY UNDER WHICH THIS BID IS SIGNED:

DATE:

H: DECLARATION OF INTEREST (MBD 4)

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.

- No bid will be accepted from persons in the service of the state*.
- Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favoritism, 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 authorized representative declare their position in relation to the evaluating/adjudicating authority and/or take an oath declaring his/her interest.

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

3.1 Full Name:

3.2 Identity Number:

3.3 Company Registration Number:

3.4 Tax Reference Number:

3.5 VAT Registration Number:

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

3.6.1 If so, furnish particulars

.....

.....

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

3.7.1 If so, furnish particulars

.....

.....

3.8 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**

3.8.1 If so, furnish particulars

.....

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

3.9.1 If so, furnish particulars

.....

3.10 Are any of the company's Directors, Managers, Principle Shareholders or Stakeholders in service of the State? **YES/NO**

3.10.1 If so, furnish particulars

.....

3.11 Are any spouse, child or parent of the company's Directors, Managers, Principle Shareholders or Stakeholders in service of the State? **YES/NO**

3.11.1 If so, 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 THE DECLARATION PROVE TO BE FALSE.

.....
SIGNATURE

.....
DATE

.....
POSITION

.....
NAME OF TENDERER

*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.

I: **DECLARATION FOR PROCUREMENT ABOVE R10 MILLION
(ALL APPLICABLE TAXES INCLUDED) (MBD 5)**

**This form shall only be completed if the Tender Sum exceeds R10 million
(all applicable taxes included).**

1. Are you by law required to prepare annual financial statements for auditing?

YES / NO (Delete whichever is not applicable)
- 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 (Delete whichever is not applicable)
- 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 (Delete whichever is not applicable)
- 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 (Delete whichever is not applicable)

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 THE DECLARATION PROVE TO BE FALSE.

.....
SIGNATURE

.....
DATE

.....
POSITION

.....
NAME OF TENDERER

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, TENDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022.

1. GENERAL CONDITIONS

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

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

1.2 To be completed by the organ of state

(delete whichever is not applicable for this tender).

- a) The applicable preference point system for this tender is the 90/10 preference point system.
- b) The applicable preference point system for this tender is the 80/20 preference point system.
- c) Either the 90/10 or 80/20 preference point system will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

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

- (a) Price; and
- (b) Specific Goals.

1.4 To be completed by the organ of state:

The maximum points for this tender are allocated as follows:

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

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

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

2. DEFINITIONS

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

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:

$$P_s = 80 \left(1 - \frac{P_t - P_{min}}{P_{min}} \right) \quad \text{or} \quad P_s = 90 \left(1 - \frac{P_t - P_{min}}{P_{min}} \right)$$

Where

P_s = Points scored for price of tender under consideration

P_t = Price of tender under consideration

P_{min} = Price of lowest acceptable tender

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) PART A B	Number of points allocated (80/20 system) (To be completed by the organ of state) PART A B	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of points claimed (80/20 system) (To be completed by the tenderer)
Ownership:				
BBBEE Level 1	5	10		
BBBEE Level 2	4	8		
BBBEE Level 3-8	2	4		
Empowerment				
1. an EME or QSE which is at least 100% owned by black people;	2	4		
2. an EME or QSE which is at least 51% owned by black people;	1	2		
3. an EME or QSE which is at 25% - 50% owned by black people;	0.5	1		
RDP				
1. Enterprise Located within the District Municipality - Rural	2	4		
2. Enterprise Located within the District Municipality - Urban	1.5	3		
2. Enterprise Located within the Province	0.5	1		
Other Specific Goal				
1. Enterprise 100% owned by Youth/Women/Disabled/ Military V	1	2		

DECLARATION WITH REGARD TO COMPANY/FIRM

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

4.4. Company registration number:

4.5. 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]

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

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;
- iv) If the specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the organ of state may, in addition to any other remedy it may have –
 - (a) disqualify the person from the tendering process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and
 - (e) forward the matter for criminal prosecution, if deemed necessary

.....
SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME:

DATE:

ADDRESS:

.....

.....

K: AFFIDAVIT OF GOOD STANDING THAT WILL BE INCORPORATED INTO THE CONTRACT

The Tenderer hereby certifies that neither it or any of the principals of the enterprise is 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. The Tenderer further certifies that none of its principals have ever been convicted of fraud.

DECLARATION *(to be signed in the presence of a Commissioner of Oaths)*

The undersigned, who warrants that he / she is duly authorized to do so on behalf of the firm, confirms that the contents of this Affidavit are within my personal knowledge, and save where stated otherwise to the best of my belief both true and correct.

Signature:

Duly authorized to sign on behalf:

Address:

.....

.....

Telephone:.....

Signed and sworn to before me at.....on

this theday ofby the Deponent, who

has acknowledged that he/she knows and understands the contents of this Affidavit, that its true and correct to the best of his/her knowledge and that he/she has no objection to taking the prescribed oath, and that the prescribed oath will be binding on his/her conscience.

Commissioner of oaths

NOTE: This affidavit comprises one (1) page all of which must be initialed by both the Deponent and the Commissioner of Oaths

L: SCHEDULE OF ALL WORK PROVIDED FOR AN ORGAN OF THE STATE OVER THE LAST FIVE YEARS

[Tenderers are to attach a schedule detailing the name of each project, the organ of state for which the project was undertaken and the date the project was completed. If not complete list the project as “current”]

M: BANKING DETAILS

Tenderers financial capacity to finance and undertake a contract of this nature will also be checked and consequently it is a requirement that the details below be provided. A letter from the bank with bank stamp confirming that the tenderer has an active bank account with the bank or a letter generated online from the Bank which also shows financial stability. If the contractor is unable to demonstrate sufficient credit facility available, the contractor must at least provide proof of guarantee or financial capacity from a reputable and accredited financial services provider.

They must also attach the proof of bank account and letter of good standing from the bank with a credit rating.

NAME OF TENDERER					
NAME OF ACCOUNT HOLDER AT BANK					
TYPE OF ACCOUNT (Please tick)	CURRENT/CHEQUE	☐	SAVINGS	☐	TRANSMISSION
BANK					
BRANCH NAME					
ACCOUNT NUMBER					
BRANCH CODE					
BANK TELEPHONE NO					
BANK ADDRESS					
NAME OF BANK MANAGER					
TELEPHONE NUMBER					
FAX NUMBER					
NO OF YEARS ABOVE ACCOUNT HAS BEEN WITH BANK					
CREDIT FACILITIES AVAILABLE (State Amount)					

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

DATE:

N: DECLARATION OF FINANCIAL CAPACITY

1. The following particulars must be furnished in support of the preceding returnable to test financial capacity.
- o No bid will be accepted from persons who cannot prove adequate financial capacity to execute the contract according to the specifications and scope of works and within the timeframes stipulated.
 - o In order to prove financial capacity, the Tenderer must attach the following:
 - (a) A letter from the bank with bank stamp confirming that the tenderer has an active bank account.
 - (b) Proof of bank account and letter of good standing from the bank with a credit rating.
 - (c) If the contractor is unable to demonstrate sufficient credit facility available, the contractor must at least provide written undertaking/proof of guarantee or financial capacity from a reputable and accredited financial services provider/lender.

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 THE DECLARATION PROVE TO BE FALSE.

.....
SIGNATURE

.....
DATE

.....
POSITION

.....
NAME OF TENDERER

O: SCHEDULE OF THE TENDERER'S EXPERIENCE

Tenderers are to provide references for **FIVE (5)** other recent projects, completed successfully within the last ten (10) years, of a similar nature with which the company has been involved.

The information provided here will be used to evaluate the Tenderer's eligibility to undertake the contract. It is important that the Tenderer ensure that sufficient and legible information is provided to enable the Employer to evaluate the criteria noted in the table in F3.11.2.

The tenderer shall attach appointment letters and completion certificates to this page in support of the quantity of bulk projects he has disclosed (as per the eligibility criteria).

Contract Number and Name	Contract Amount	Points that can be claimed per Contract	Tenderer to enter points claimed here	Points awarded by Evaluator
		The Tenderer can claim up to a maximum of 8 points per contract completed priced at > R20 million of a similar or more complex nature		
TOTAL POINTS		Maximum Points = 40		

The contractor must obtain referee reports from the client's representative or the Client using the form below.

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

DATE:

REFEREES REPORT OF PERFORMANCE ON PREVIOUS RELEVANT PROJECTS COMPLETED:*(make copies and supply referee with copy of report)***Contractor :****Project Name :****Contract Number:****Contract Completed Value (R):****Date Started:** **Date completed:**

Category.	Yes	No
Project Delivery: Did the Contractor comply with specification?		
Financial Capacity: Did the contractor have adequate funds available for the project?		
Contract Administration: Did the contractor have an efficient contract administration system?		
Programme: Did the Contractor adhere to the programme?		
SHEQ: Did the Contractor comply with Health and Safety, Environmental and Quality requirements?		
Communication: Did the Contractor provide the Employer/Employer's Agent with copies of all site records on site, i.e. site diaries, material delivery notes, safety files, incidence reports, etc.?		
Would you recommend the future use of this service provider by your organisation or any other Organisation		
If No, then why not?		

Referee's Details:**Organisation :****Organisation Representative:****Position in the Organisation:****Signature :** **Date :****Client Stamp**

P: KEY PERSONNEL

In terms of the Project Specification, all unskilled workers are to be locally sourced.

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

Category of Employee	Number of Persons					
	Key Personnel, Part of the Contractor's Organisation		Key Personnel to be imported if not available locally		Unskilled Personnel to be recruited from local community	
	PDI	NON-PDI	PDI	NON-PDI	PDI	NON-PDI
Project /Construction Manager						
Site Agent / Resident Engineer						
Site Forman						
Artisans and other Skilled Workers						
Unskilled Workers						

Designation	Names	Project Type	Value of Works	Year Completed
LIC NQF 5 Supervisors				

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

DATE:

Q: CURRICULUM VITAE OF KEY PERSONNEL

The success of this project will largely depend on the ability of the project manager, site agent / resident engineer /**site foreman** to manage local resources that are largely unskilled. The Tenderer must indicate who they intend using for this function and must list the incumbent’s experience.

Failure to provide proof of a suitable candidate (including certified qualification and signed CV) to manage the work on a permanent basis on site during the currency of the contract will result in dis-qualification in terms of Clause F2.1.

Project Manager Name (Civil):	Years with firm:
Qualifications:	
NQF 7 Registration Number:	
<u>Employment Record:</u>	
<u>Experience Record Pertinent to Required Service:</u>	
(Indicate no. of years experience managing civil engineering construction projects in water related activities including experience in reinforced concrete water retaining structures and/or Water treatment works)	

List of Projects				
	Project name	Year	Type of Structure/ Item	Value of Structure/ Item
Reinforced concrete water retaining structures				
Water treatment works				

Site Agent Name (Civil):	Years with firm:
Qualifications:	
NQF 6 Registration Number:	
<u>Employment Record:</u>	
<u>Experience Record Pertinent to Required Service:</u>	
(Indicate no. of years experience managing civil engineering construction projects in water related activities including experience in reinforced concrete water retaining structures and/or Water treatment works)	

List of Projects				
	Project name	Year	Type of Structure/ Item	Value of Structure/ Item
Reinforced concrete water retaining structures				
Water treatment works				

Site Foreman (Civil):	Years with firm:
Qualifications:	
NQF 4 Registration Number:	
<u>Employment Record:</u>	
<u>Experience Record Pertinent to Required Service:</u>	
(Indicate no. of years experience managing civil engineering construction projects in water related activities including experience in reinforced concrete water retaining structures and/or Water treatment works)	

List of Projects				
	Project name	Year	Type of Structure/ Item	Value of Structure/ Item
Reinforced concrete water retaining structures				
Water treatment works				

Safety Officer:	Years with firm:
SAMTREC accredited Qualifications:	
NQF Registration Number:	
<u>Employment Record:</u>	
<u>Experience Record Pertinent to Required Service:</u>	

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

DATE:

R: SCHEDULE OF PLANT AND EQUIPMENT

It is important that the Tenderer be able to demonstrate that he/she has adequate plant and equipment to efficiently execute the proposed scope of works.

The Tenderer's response to this section will be used in assessing the eligibility of the tender offer.

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

Quantity	Description	Size	Capacity

Attach additional pages if more space is required.

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

Quantity	Description	Size	Capacity

Attach additional pages if more space is required.

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

DATE:

S: SCHEDULE OF PROPOSED SUB-CONTRACTORS

We notify you that it is our intention to employ the following Sub-Contractors for work on this Tender.					
	Name and Address of Proposed	Nature and Extent of Work	CIDB Grading	Previous Experience working with this	Value of work
1.					
2.					
3.					
4.					
5.					

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

DATE:

T: PROVISIONAL 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 tender.

The programme must indicate all key activities, time frames, critical path and must clearly demonstrate the Tenderer’s understanding of the scope of works.

The competency and clarity of the programme will help to inform the Employer’s assessment of the Tenderer’s eligibility to execute the contract.

The Tenderer shall submit their preliminary programme in “MS Projects” or similar project management software format.

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

DATE:

U: SCHEDULE OF LABOUR CONTENT

The tenderer must complete a standard table reflecting the labour force anticipated to be employed on this contract, including labour employed by sub-contractors. The Specified target value is 10%

Type of Labour	Man-Days	Minimum Wage Rate per unit	Total Wage Cost (Excl VAT)
Permanent Staff			
Temporary Staff			
SMME/HDEs Labour			
		Total	
		Percentage	

Notes to Tenderer:

Labour is defined as hourly paid personal

The penalty for non-compliance during the contract or fraudulent disclosure is discussed in contract data (item 5.13.2) .

The minimum Labour Content for this Project shall be 5% calculated as the amount spend on labour wage divided by the total value of the project. The minimum job creation targets on the project shall be:

	Total	Women	Youth	Disabled
Work Opportunities	37	10	15	2
Person Days	5 920	1 600	2 400	320
Training Days	20	5	5	5

V: TRAINING SCHEDULE

Name of Training Institution :

Name of Programme :

Trainers Name	Qualification	Subject

Note to tenderer:

Provide details here, or attached hereto, the subjects to be covered and the manner in which training is to be delivered.

W: 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) Amendments to the General and Special Conditions of Contract are not acceptable;

(2) The Tenderer must give full details of all the financial implications of the amendments and qualifications in a covering letter attached to his 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 will be prejudiced

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

DATE:

**X: WORKMANS' COMPENSATION REGISTRATION CERTIFICATE (OR PROOF OF PAYMENT
OF CONTRIBUTIONS IN TERMS OF THE COMPENSATION FOR OCCUPATIONAL INJURIES
AND DISEASES ACT NO. 130 OF 1993)**

[Certified Copy of the Certificate or Proof of Payment thereof obtained from the Workmen's Compensation Commissioner to be inserted here]

Y: TAX CLEARANCE CERTIFICATE

IMPORTANT NOTES:

1. The following is an abstract from the Preferential Procurement Regulations 2017 promulgated with the Preferential Policy Framework Act No 5 of 2000:

"Tax clearance certificate

No contract may be awarded to a person who has failed to submit an original valid Tax Clearance matters or Certificate from the South African Revenue Service ("SARS") certifying the taxes of that person to be in order or that suitable arrangement have been made with SARS."

2. The ST 5.1 form, Application for Tax Clearance Certificate (in respect of tenders), must be **completed by the tenderer in every detail and submitted to the Receiver of Revenue** where the tenderer is registered for income tax purposes. The Receiver of Revenue will then furnish the tenderer with a Tax Clearance Certificate that will be valid for 12 months from date of issue. **This Tax Clearance Matters or Certificate must be submitted in the original valid with the tender that is before the closing time and date of the tender.**

Each party to a Consortium/Joint Venture/Sub-contractors must complete a separate Tax Clearance Certificate.

SARS has implemented a new Tax Compliance Status (TCS) system in terms of which a taxpayer is now able to authorize any 3rd party to verify its compliance status in one of two ways: either through the use of an electronic access PIN or through the use of a Original valid Tax Clearance Certificate obtained from the new TCS system. All Bidders are required to provide the following to Ugu District Municipality in order to enable it to verify their tax compliance status:

Trading Name: _____

Tax reference number: _____

Request reference number: _____ and

PIN: _____.

No tender may be awarded to any tenderer whose tax matters have not been declared to be in order by SARS.

[Tax Clearance information must be provided and attached to this page as requested above as obtained from TCS Systems of SARS]

[Failure to provide proof of requested Tax Compliance Status Information will invalidate Service Provider tender offer]

Z: DECLARATION OF PAYMENT OF MUNICIPAL SERVICES

DECLARATION TO CERTIFY THAT:

THE TENDERER HAS NO UNDISPUTED COMMITMENTS FOR MUNICIPAL SERVICES TOWARDS A MUNICIPALITY OF WHICH PAYMENT IS OVERDUE FOR MORE THAN 30 DAYS

DECLARATION

The undersigned, who warrants that he/she is duly authorized to do so on behalf of the firm, confirms that there are no undisputed commitments for municipal services towards a municipality of which payment is overdue for more than 30 days to my personal knowledge, and save where stated otherwise to the best of my belief both true and correct.

Signature:

Duly authorized to sign on behalf of:

Address:

.....

.....

Telephone:

Date:

Municipal rates statement must be attached to this page. Proof of payment may be attached only in the event that the Tenderer has recently paid the outstanding balance but it has not reflected on the municipality's records.

Z1: AFFIDAVIT OF TENDERER THAT DOES NOT HAVE A MUNICIPAL RATES ACCOUNT BUT IS WORKING FROM A RESIDENTIAL ADDRESS OR IN AN AREA WHERE PAYMENT FOR MUNICIPAL SERVICES IS NOT APPLICABLE

The purpose of this affidavit is to declare that the Tenderer is

- working from a residential address or
- any other means

to declare that neither it nor any of the principals of the enterprise has any existing municipal accounts in any municipal area in the republic of South Africa that have not been disclosed in this tender and that failure to disclose such will lead to disqualification or cancellation of the Tender.

DECLARATION *(to be signed in the presence of a Commissioner of Oaths)*

The undersigned, who warrants that he / she is duly authorized to do so on behalf of the firm, confirms that the contents of this Affidavit are within my personal knowledge, and save where stated otherwise to the best of my belief both true and correct.

Signature:

Duly authorized to sign on behalf:

Address:

.....

.....

Telephone:.....

Signed and sworn to before me at.....on

this theday ofby the Deponent,
who

has acknowledged that he/she knows and understands the contents of this Affidavit, that its true and correct to the best of his/her knowledge and that he/she has no objection to taking the prescribed oath, and that the prescribed oath will be binding on his/her conscience.

Commissioner of oaths

NOTE: This affidavit comprises one (1) page all of which must be initialed by both the Deponent and the Commissioner of Oaths

NOTE: A letter from a Councillor or Tribal Authority must be attached in support of the address disclosed above.

**Z2: DECLARATION OF TENDERER WHO DOES NOT HAVE A MUNICIPAL RATES ACCOUNT BUT
IS RENTING OR LEASING AN OFFICE**

This is a declaration that:

**THE TENDERER DOES NOT HAVE A MUNICIPAL RATES ACCOUNT BUT IS LEASING OR RENT-
ING OFFICE SPACE FROM A LANDLORD**

DECLARATION

The undersigned, who warrants that he/she is duly authorized to do so on behalf of the firm, confirms that the Tenderer does not have a municipal rates account but is leasing or renting office space from a Landlord.

Signature:

Duly authorized to sign on behalf of:

Lease Address:

.....

.....

Telephone:

Date:

NOTE: Lease Agreement to be attached to this page

AA: CONTRACTOR'S HEALTH AND SAFETY DECLARATION

[Copy of Health and Safety Plan indicating all health and safety activities required to execute the works compiled by Safety Officer, from Key Personnel on Page T70, to be inserted here]

In terms of the Occupational Health and Safety Act No 85 of 1993 a Contractor may only be appointed to perform key services if the *Purchaser* is satisfied that the Contractor has the necessary competencies and resources to carry out the work safely in accordance with the provisions of the Act.

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) herein after referred to as the "Act"
2. I hereby declare that my company has the competence and the necessary resources to safely carry out the services specified under this contract in compliance with the Employer's Health and Safety Specifications.
3. I propose to achieve compliance with the Regulations by one of the following:

(a)	From my own competent resources	*Yes / No
(b)	From my own resources still to be appointed or trained until competency is achieved	*Yes / No
(c)	From outside sources by appointment of competent specialist subcontractors	*Yes / No

(* = delete whatever is not applicable)

4. I confirm that copies of my company's approved Health and Safety Plan, will at all times be available for inspection by the *Purchaser's* personnel, UDM 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 schedule of quantities to cover the cost of all resources, actions, training and all health and safety measures envisaged in the Act and that I will be liable for any penalties that may be applied for failure to comply with the provisions of the Act.
1. I agree that my failure to complete and execute this declaration to the satisfaction of the *Purchaser* will mean that I am unable to comply with the requirements of the Act and accept that my tender will be prejudiced and may as a result be rejected at the discretion of the *Purchaser*.

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

DATE:

AB: NATIONAL TREASURY'S CENTRAL SUPPLIER DATABASE

Tenderers are required to self-register on National Treasury's Central Supplier Database (CSD) which has been established to centrally administer supplier information for all organs of state and facilitate the verification of certain key supplier information. UDM is required to ensure that price quotations are invited and accepted from prospective bidders listed on the CSD. Business may not be awarded to a Tenderer who has failed to register on the CSD. Only foreign suppliers with no local registered entity need not register on the CSD. The CSD can be accessed at <https://secure.csd.gov.za/>. Tenderers are required to provide the CSD summary form and the information below to UDM in order to enable it to verify information on the CSD:

Supplier Number: _____ Unique registration reference number: _____.

AC: PROFORMA FORMS TO BE COMPLETED BY SUCCESSFUL TENDERER

- PERFORMANCE GUARANTEE
- DISCLOSURE STATEMENT
- ADJUDICATION BOARD MEMBER AGREEMENT
- PRO FORMA NOTIFICATION FORM IN 1993 CONSTRUCTION REGULATIONS 2003
- INSURANCE APPLICATION IF TO BE COVERED BY UDM INSURANCE POLICY AS PROVIDED FOR IN THE CONDITIONS OF CONTRACT

PRO FORMA PERFORMANCE GUARANTEE

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

GUARANTOR DETAILS AND DEFINITIONS

“Guarantor” means:

Physical address.....

“Employer” means:

“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 Contracts as may be agreed in writing between the parties.

“Contract Sum” means: The accepted amount inclusive of tax of R

Amount in words:

“Guaranteed Sum” means: The maximum aggregate 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 a suretyship.
 - 3.2 its obligation under this Performance Guarantee is restricted to the payment of money.
4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:
 - 4.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Engineer in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 4.2;
 - 4.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 4.1 and the sum certified has still not been paid;
 - 4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.
5. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:
 - 5.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or
 - 5.2 a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 5; and
 - 5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.
6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.
7. Where the Guarantor has made payment in terms of 5, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received

in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.
9. Payment by the Guarantor in terms of 5 will only be made against the return of the original Performance Guarantee by the Employer.
10. The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.
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 a liquid document for the purposes of obtaining a court order.
14. Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at

Date

Guarantor's signatory (1)

Capacity

Guarantor's signatory (2)

Capacity

Witness signatory (1)

Witness signatory (2)

PRO FORMA DISCLOSURE STATEMENT

(Please note that words in italics within brackets are items which should be stated)

Date:

Contract: **REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1**

Contractor: _____

Employer: **UGU DISTRICT MUNICIPALITY**

Engineer: **DLV Project Managers & Engineers (Pty) Ltd**

Dear Sirs

I am willing and available to serve as ad-hoc Adjudication Board Member in the abovementioned 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:

- I shall act with complete impartiality and know of nothing at this time, which could affect my impartiality.
- I have had no previous involvement with this project.
- I do not have any financial interest in this project.
- I am not currently employed by the Contractor, Employer or Engineer.
- I do not have any financial connections with the Contractor, Employer or Engineer.
- I do not have or have had a personal relationship with any authoritative member of the Contractor, Employer or the Engineer which could affect my impartiality.
- I undertake to immediately disclose to the parties any changes in the above position which could affect my impartiality or be perceived to affect same.

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

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:

PRO FORMA ADJUDICATION BOARD MEMBER AGREEMENT

(Please note that words in italics within brackets are items which should be stated)

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, Third Edition, 2015, 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 Members 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 *(amount)* for *(number)* of months, and /or
 - b. A daily fee of *(amount)* based on a *(number)* hour day, and/or
 - c. An hourly fee of *(amount)*, and/or
 - d. A non-recurrent appointment fee of *(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 amounts so that the fees and expenses are borne equally by the Parties. Late payment of such invoice shall attract interest at prime plus 3% points compounded monthly at the prime rate charged 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:

**Delete the inapplicable party*

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

[This form must be completed and forwarded, prior to commencement of work on site, by all Contractors that qualify in terms of Regulation 3 of the Construction Regulations 2003, 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 workman'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:

CONTRACT AWARD DECLARATION AND RISK/INSURANCE CHECKLIST

XXXXXX (Pty) Ltd

Tel xxxxx: Fax xxxxx

CONTRACTORS ALL RISK & LIABILITY
GENERAL QUESTIONNAIRE

A. BROKER DETAILS

Name of Broker Company : XXXXX

Fax Number : XXXXX

Telephone No. : XXXXXX

e-mail Address : XXXXXX

Contact Person : XXXXXXXX

B. GENERAL

Name of Insured : XXXXX

Postal Address : XXX

Insured's VAT Number : XXXX

Telephone No. : XXX

Name of Main Contractor :

Name of Principal/Employer : XXXX

Names of Sub Contractors :

Name of Consultants :

Tender No. :

C. ONCE OFF / SPECIFIC CONTRACTS POLICY

C1. Contract Value :

(Attach copy of Contract Cost Breakdown and Tender Details)

Note: The Contract Value must include the Total Cost of Materials, Labour, Free Issue Materials, P&G's and any other Contractual Income + V.A.T. Also, please stipulate the form of contract to be used (BIFSA 81/88, JBCC 91, GCC 2015, FIDIC etc.). Any particular information regarding the insurance specification and or excesses applicable should be attached.

C2. Contract Title / Full Description of Contract:

C3. What work will be done by Sub Contractors:

N/A

C4. Site Location

Ulundi municipal area

C5. The Contract Site Details:

Level		Sloping		Rocky	
Sandy		Clay			
Built up Areas		Remote Area			

Close Proximity to:

Rivers, dams known watercourse

Yes

No

Highway motorways airport etc.

Yes

No

Security Precautions. Give Details

C6. Contract Period / Period of Insurance

: From

To

C7. Maintenance Period Required

: ? Months

C8. Surrounding Property / Property Under Custody Control (Not being Part of Contract Works) : N/A

Limit of Indemnity Required : R

C9. STRIKE RIOT INSURANCE (SASRIA)

Yes	

No	

D. CONTRACTORS PUBLIC LIABILITY

D1. Limit of Indemnity Required : R 2,000,000

D2. Public Liability:

Use of Explosives

Yes	

No	

Site Security

* Adequately Fenced Off

Yes	

No	

* Access Control to Site

Yes	

No	

Comment on density of pedestrian and vehicle traffic in the immediate vicinity of the site e.g. Busy shopping mall or isolated area:

Isolated area

D3. Removal of Support (Lateral Support)

If required, please refer. : N/A

E. PREVIOUS INSURANCE

E1. Name of Previous Insurer :

E2. Claims Experience / Details :

E3. Supporting Business :

F. GENERAL COMMENTS

Please comment on "Removal of Support", limitations of liability if any, possible interference with existing structures and crack surveys if applicable.

Please comment on whether refurbished or used equipment is to be refurbished. Please state the testing and commissioning period of mechanical or electrical equipment.

Please advise as to whether any phased or progressive handover is anticipated or whether any part of the works will be given over to the Employer prior to the issue of a Certificate of Completion.

NOTE:

Self-Propelled Plant, Tools and Equipment are not covered under this specific Policy and should be insured separately i.e. under business all risks or plant all risks policies.

SIGNED FOR THE INSURED**DATE****Name of Signatory****:**

On award of contract, send to:

XXXXXXXXXX**From:**Attention: **XXXX**Fax No; **XXXX****This form is to be accompanied by a copy of the letter of award or a copy of the signed Agreement**

APPENDIX A : CONTRACTORS CLAIMS ADVICE FORM – PCI**SEND TO :**

XXXXXXXXXX

FROM: *(PLEASE PROVIDE NAME OF CONTRACTING COMPANY, SITE ADDRESS,
TELEPHONE AND FAX NUMBER)**Fax No.: xxxxx****REPRESENTED BY:**

CONTRACT SITE :

CONTRACT VALUE :

DATE OF LOSS :

REPORTED TO SITE AGENT BY :

DATE :

REPORTED TO AON SOUTH AFRICA BY :

DATE :

Locality of Incident

How did the loss occur (cause)

Details and nature of loss or damage to Contract Works

Details of other property damaged

Name and address of witness

Estimated cost of repairs (Separate records of all costs must be kept)

Who or what appears to be responsible for the loss/damage

Person whom assessor should contact

Telephone

SIGNED BY :

COMPANY

SIGNATURE :

AD: DECLARATION OF SOLVENCY OR LIQUIDITY

The bid of any bidder may be rejected if that bidder, or any of its directors are:

- a. Under liquidation
- b. Sequestration
- c. Insolvency.

This Clause is applicable even after the bid is awarded.

We, the undersigned directors, declare that they are not under liquidation, sequestration or insolvency.

No	Name of Director	ID number	Signature

- All tenderers attention is drawn to this Form (declaration of Solvency or Liquidity of the tenderer).
- All tenderers are therefore required to complete It.
- Failure to complete the form or attempt to falsify or hide this information may render the tender non-responsive.

AE: QUALITY MANAGEMENT SYSTEM

[Certified Copy of the ISO 9001:2015 Quality Management System Certificate in respect of Construction Project Management within the built environment or Copy of Internal / Uncertified Quality Management System in respect of Quality Management and Environmental Management within the built Environment to be inserted here]

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise, confirms that the contents of the attachments are within my personal knowledge and are to the best of my belief both true and correct.

Signed

Date

Name

Position

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C1 AGREEMENTS AND CONTRACT DATA**C1.1 FORM OF OFFER AND ACCEPTANCE****OFFER**

The Employer, identified in the acceptance signature block, has solicited offers to enter into a contract for the procurement of the **UGU-07-1683-2024 – UGU DISTRICT MUNICIPALITY REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 1)**

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

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

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

.....

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

Name: (*of signatory in capitals*):

Capacity: (*of Signatory*):

Name of Tenderer: (*organisation*):

Address:

.....

Telephone number: **Fax number:**

Witness:

Name / Signature:

Date:

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 include this agreement)
- Part C2 Pricing data
- Part C3 Scope of work
- Part C4 Site information

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

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

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

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

For the Employer:

Signature:

Name: (in capitals)

Capacity:

Name of Employer: UGU DISTRICT MUNICIPALITY

Address: 96 Marine Drive, Phase 2 Building, Oslo Beach, Port Shepstone, 4240

Witness:

Name / Signature:

Date:

SCHEDULE OF DEVIATIONS

Notes:

1.

The extent of deviations from the tender documents issued by the Employer before the tender closing date is limited to those permitted in terms of the conditions of tender.
2.

A Tenderer’s covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid becomes the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
3.

Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the parties becomes an obligation of the contract shall also be recorded here.
4.

Any change or addition to the tender documents arising from the above agreements and recorded here shall also be incorporated into the final draft of the contract.

1.

Subject:

Details:
2.

Subject:

Details:
3.

Subject:

Details:
4.

Subject:

Details:

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

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

For the Tenderer:

For the Employer:

Signature

Name

Capacity

Name and address of organisation:

Name and address of organisation:

Witness Signature

Witness Name

Date

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

C1.2 CONTRACT DATA**C1.2.1 CONDITIONS OF CONTRACT****C1.2.1.1 GENERAL CONDITIONS OF CONTRACT**

The General Conditions of Contract for Construction Works Third Edition 2015 published by the South African Institution of Civil Engineering are 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 and www.saice.org.za).

The General Conditions of Contract for Construction Works make several references to the Contract Data for specific data, which together with these conditions collectively describe the risks, liabilities and obligations of the contracting parties and the procedures for the administration of the Contract. The Contract Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the general conditions of contract.

Each item of data given below is cross-referenced to the clause in the General Conditions of Contract for Construction Works to which it mainly applies.

C1.2.1.2 SPECIAL CONDITIONS OF CONTRACT**C1.2.1.2.1 GENERAL**

These Special Conditions of Contract (SCC) form an integral part of the Contract. The Special Conditions of Contract shall amplify, modify or supersede, as the case may be, the GCC 2015 to the extent specified below, and shall take precedence and shall govern.

The clauses of the Special Conditions of Contract hereafter are numbered "SCC" followed in each case by the number of the applicable clause or subclause in the GCC 2015, and the applicable heading, or (where a new special condition that has no relation to the existing clauses is introduced) by a number that follows after the last clause number in the GCC 2015, and an appropriate heading.

C1.2.1.2.2 AMENDMENTS TO THE GCC 2015**SCC 4.10.1 Engagement of employees**

Add the following to Clause 4.10.1:

"The contractor shall pay rates and wages, and observe conditions of labour, which are not lower than those established for the trade or industry where the work is carried out, as stated in the Contract Data."

SCC 5.3 Commencement of the Works

Delete the entirety of Clauses 5.3.1, 5.3.2 and 5.3.3 and replace them with the following:

"SCC 5.3.1 Commencement of the Works

Upon the Employer's Agent's instruction, the Contractor shall, save as may be otherwise provided in the Contract, or be legally or physically impossible, commence carrying out the Works. Such instruction shall be provided not later than 14 days after the Commencement Date. Such instruction shall be subject to:

SCC 5.3.1.1 The timely submission by the Contractor, and approval by the Employer's Agent, of documentation required before commencing to carry out the Works and before the Employer applying for a permit to do construction work, as set out in the Contract Data,

SCC 5.3.1.2 Application by the Employer for a permit to do construction work in terms of Regulations 3(1) and (2) of the Construction Regulations 2014, and

SCC 5.3.1.3 Receipt by the Employer of the permit to do construction work.**SCC 5.3.2 Unacceptable documentation**

If the documentation referred to in Clause SCC 5.3.1 is not submitted within the number of days stipulated in the Contract Data from the date that the Agreement, made in terms of the Form of Offer and Acceptance, comes into effect, or if such documentation is found to be unacceptable, the Employer may terminate the Contract in terms of Clause 9.2.

SCC 5.3.3 Time to instruct commencement of the Works

Where the Contractor delays the submission by the Employer of the application for a permit to do construction work and such permit is not received within 14 days following the Commencement Date such that the Employer's Agent's instruction to commence carrying out the Works cannot be given, without prejudice to the Employer's rights to terminate the contract under Clause 9.2, the Employer's Agent shall delay issuing the instruction to commence carrying out the Works until such time as the permit to do construction work has been received. The Contractor shall have no entitlement under Clause 5.12 to an extension of time for Practical Completion.

Where the permit to do construction work is not received within the 14 day period following Commencement of the Contract for reasons not attributable to the Contractor, the Employer's Agent shall delay the instruction to commence the Works and the Contractor shall be entitled to make a claim in accordance with Clause 10.1."

SCC 5.14.4 Certification of Completion

Insert the following in the first sentence after the words "has been duly completed,":

"and the Contractor has submitted the information stated in the Contract Data,".

SCC 5.14.6 Occupation by the Employer

Add the following to Clause 5.14.6:

"The use of any parts of the Works, whether for unhindered use by the public or for accommodation of traffic, while other parts are being constructed, shall not constitute occupation of the Works by the Employer."

SCC 6.2.1 Delivery of security

In the last two lines of Clause 6.2.1, delete the words "the type of security for the due performance of the Contract, as selected in the Contract Data" and replace them with the words "a fixed performance guarantee as security for the due performance of the Contract in accordance with the Contract Data Part 1: Data Provided by the Employer".

Delete the entirety of Clause 6.2.2 and replace it with the following:

"SCC 6.2.2 Contractor failing to provide security

If the Contractor fails to provide the required fixed performance guarantee within the time period stated in the Contract Data, or if the performance guarantee shall differ substantially from the pro forma, it shall legally be deemed that the Contractor has selected a security of ten per cent retention of the value of the Works without limiting the Employer's right to terminate the Contract in terms of Clause 9.2."

SCC 6.2.3 Validity of performance guarantee

Delete the entirety of the first sentence of Clause 6.2.3 and replace it with the following:

"The Contractor shall ensure that the performance guarantee remains valid and enforceable until the Certificate of Completion is issued."

SCC 6.8.2 Application of the Contract Price Adjustment Factor

Add the following to the end of Clause 6.8.2:

“Referring to Clause 1 of the “CONTRACT PRICE ADJUSTMENT SCHEDULE” on page 86 of the GCC 2015, delete the paragraph describing the symbols “L”, “P”, “M” and “F”, and replace it with the following:

“L”, “P”, “M” and “F” are defined as follows:

“L” is the “Labour Index” and shall be the Consumer Price Index for the province as stated in the Contract Data as published in Table A of the Statistical release P0141 of Statistics South Africa.

“P” is the “Contractor’s Equipment Index” and shall be the Producer Price Index for “Plant and Equipment” as published in Table 4 of the Statistical release P0151.1 of Statistics South Africa.

“M” is the “Materials Index” and shall be the Producer Price Index for “Civil engineering material – Total” as published in Table 6 of the Statistical release P0151.1 of Statistics South Africa.

“F” is the “Fuel Index” and shall be the Producer Price Index for “Diesel” as published in Table 1 of the Statistical release P0142.1 of Statistics South Africa.”

SCC 6.10.4 Delivery, dissatisfaction with and payment of payment certificate

In the first three lines of Clause 6.10.4, delete the word “days” and replace them with the words “working days”.

Delete “within 28 days” in the third sentence and substitute “within 30 days”.

SCC 6.10.8 Contractor’s completion statement

Delete “within 28 days” in the third sentence and substitute “within 30 days”.

SCC 6.10.9 Final Payment Certificate

Delete “within 28 days” in the second sentence and substitute “within 30 days”.

SCC 10.1.5 Employer’s Agent’s ruling on Contractor’s Claim

Delete “within 28 days” in the first sentence and in Clause 10.1.5.1, and substitute “within 56 days”.

PART 1 : DATA TO BE PROVIDED BY THE EMPLOYER

REF. CLAUSE NO.	DATA BY EMPLOYER	
1.1.13	The Defects Liability Period is:	12 months
1.1.1.15	The name of the Employer is:	UGU DISTRICT MUNICIPALITY
1.1.1.26	The Pricing Strategy is:	Re-measurement
1.2.1.2	The address of Employer:	
	<u>Physical:</u>	<u>Postal:</u>
	96 Marine Drive, Phase 2 Building, Oslo Beach. PO Box 33	

	Port Shepstone, 4240	Port Shepstone, 4240
	Telephone No: (039) 688 3536	
1.1.1.16	Name of Engineer:	DLV Project Managers & Engineers (Pty) Ltd
1.2.1.2	Address of Engineer:	
	<u>Physical:</u>	<u>Postal:</u>
	144 Mark Street	P O Box 1460
	Vryheid,3100	Vryheid, 3100
	Telephone No :034 980 7242 e-mail: anesh@dlveng.co.za	Fax No: 034 983 2765

REF. CLAUSE NO.	DATA BY EMPLOYER
5.3.1	The documentation required before commencement with Works execution are:
	- Initial programme (Refer to Clause 5.6) - Insurance (Refer to Clause 8.6)
5.3.2	The time to submit the documentation required before commencement with Works execution is: 14 Days
5.8.1	Non-working days are: Sundays
	The special non-working days are: Public holidays and the year-end break which commences on the first working day after 15 December and ends on the first Tuesday after 5 January of the next year.
5.13.1	The penalty for failing to complete the Works is: the lesser of R2500 or 1/20 of 1% of the offered total of prices excluding VAT per calendar day.
5.13.2	The penalty for non-compliance during the contract or fraudulent disclosure is: R2,500 excluding VAT per calendar day until the contractor becomes compliant.
5.16.3	The latent defect period is: 5 years
6.2.1	The security to be provided by the Contractor shall be: Fixed Performance Guarantee of 10% of the Contract Sum.
6.5.1.2.3	The percentage allowances to cover overhead charges:
	10% of the gross remuneration of workmen and foremen actually engaged in the daywork; and 10% on the net cost of materials actually used
6.8.2	Application of the Contract Price Adjustment Factor The value of payment certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule with the following data. The values of the coefficients for calculating the Contract Price Adjustment Factor are: Water and Sewer Reticulation: x = 0,1 a = 0,15 b = 0,20 c = 0,55 d = 0,10 "L", "P", "M" and "F" are defined as follows:

	"L" is the "Labour Index" and shall be the Consumer Price Index for "Geographic Indices > CPI per province > KwaZulu-Natal" as published in Table A of the Statistical Release P0141 of Statistics South Africa. "P" is the "Construction Equipment Index" and shall be the Construction Materials Price Index for "Plant and equipment" as published in Table 4 of the Statistical Release P0151.1 of Statistics South Africa. "M" is the "Materials Index" and shall be the Construction Materials Price Index as published in Table 6 of the Statistical Release P0151.1 of Statistics South Africa for: Water and Sewer Reticulation: "Civil engineering material - Total" "F" is the "Fuel Index" and shall be the Producer Price Index for "Coke, petroleum, chemical, rubber and plastic products > Coal and petroleum products > Diesel" as published in Table 1 of the Statistical Release P0142.1 of Statistics South Africa. The base month is the month preceding the month of tender closure. Any index calculated by means of a linking factor between an old and new index, shall be rounded to one decimal place.
6.10.1.5	The percentage advance on materials not yet built into the Permanent Works is: 80% provided a cession in favor of the Employer is provided from both the supplier and the Contractor.
6.10.3	The limit of retention money is: 10% of each payment certificate up to a maximum of 5% of the offered total of prices excluding VAT if a performance guarantee (6.2.1) is provided or 10% of each payment certificate up to a maximum of 10% of the offered total of prices excluding VAT if a performance guarantee(6.2.1) is not provided
6.10.4	Payment period: The Employer shall pay the amount due to the Contractor within 30 days of receipt by the Employer of the payment certificate signed by the Employers Agent.
8.6.1	INSURANCE EFFECTED BY THE EMPLOYER The Employer will not provide any insurance. The Contractor may request that the Contract Works Insurance, SASRIA Special Risks Insurance and Public Liability Insurance be included on the Employer's Insurance Policy. The cost of this insurance will then be for the Contractor's account and will be deducted from money due to the Contractor. The Contractor will also be liable for the cost of any deductibles (first amount payable). INSURANCE EFFECTED BY THE CONTRACTOR a) The Contractor and Sub-contractor shall where applicable provide as a minimum the following: i) Contract Works, SASRIA and Public Liability Insurance; ii) Insurance of Construction Plant and Equipment (including tools offices and other temporary structures and contents) and other things (except those intended for incorporation into the Works) brought onto the site for a sum sufficient to provide for their replacement; iii) Insurance in terms of the provisions of the Compensation for Occupational Injuries and Diseases Act (COIDA) Act No 130 of 1993; iii) Employers Common Law Liability Insurance with a limit of indemnity of not less than R 1 000 000.00; iv) Motor Vehicle Liability Insurance comprising (as a minimum) "balance of Third Party" Risks including Passenger Liability indemnity of not less than R 1 000 000.00 (one million Rand); and v) Where the Contract involves manufacturing and/or fabrication of the Works or parts thereof at premises other than at the Contract Site the Contractor shall satisfy the Employer that all materials and equipment for incorporation in the Works are adequately insured during manufacture and/or fabrication. In the event of the Employer having an insurable interest in such Works during manufacture or fabrication then such interest shall be noted by the endorsement to the relevant Policies of Insurance.

	The Contractor shall within fourteen (14) days of commencement of the contract produce to the Employer the relevant Policies of Insurance. Notwithstanding anything elsewhere contained in this Contract without limiting the obligations liabilities or responsibilities of the Contractor in any way whatsoever (including but not limited to any requirement for the provision by the Contractor of any other insurances) the Employer may, on behalf of the Contractor, effect and maintain as appropriate in the joint names of the Employer the Contractor and where the relevant Sub-contractors the following insurances which are subject to the terms, limits, exceptions and conditions of the Policy. CONTRACT WORKS AND SASRIA SPECIAL RISKS INSURANCE – which will provide cover against accidental physical loss or damage to the Works, Temporary Works and materials intended for incorporation in the Works. PUBLIC LIABILITY Insurance – which will provide indemnity against legal liability in the event of accidental death of or injury to third persons and/or loss of or damage to third party property arising directly from the execution of the contract and occurring during the period of insurance with a limit of indemnity of R 2,000,000.00 in respect of all claims arising from any one occurrence or series of occurrences consequent on or attributable to one source or original cause. The Employer shall pay the premium in connection with the insurance effected by the Employer and recover all costs associated therewith from money due to the Contractor. Any further clarification of the scope of cover provided by the policies arranged by the Employer should be obtained from the Employer or their Insurance Brokers. In the event of any occurrence which is likely to or could give rise to a claim under the insurances arranged by the Employer the Contractor shall: - (i) in addition to any statutory requirement or other requirements contained in the Contract immediately notify the Employer's Insurance Brokers or the Insurers by telephone, telefax giving the circumstances nature and an estimate of the loss or damage or liability; (ii) complete a claims advice form available from the insurance brokers to whom the form must be returned without delay; and (iii) negotiate the settlement of claims with the Insurers through the Employer's insurance brokers and shall when required to do so obtain the Employer's approval of such settlement. The Employer and Insurers shall have the right to make all and any queries on the site of the Works or elsewhere as to the cause and the results of any such occurrence and the Contractor shall co-operate in the carrying out of such enquiries. The Contractor will be liable for the amount of the deductible (First Amount Payable) in respect of any claim made by or against the Contractor or Sub-contractors under the insurance effected by the Employer. Any amount which becomes payable to the Contractor or any of his Sub-contractors as a result of a claim under the Contract Works Insurance shall if required by the Employer be paid net of the deductible to the Employer who shall pay the Contractor from the proceeds of such payment upon rectification repair or reinstatement of the loss or damage but this provision shall not in any way affect the Contractor's obligations and liabilities or responsibilities in terms of the Contract.
8.6.1.1.3	R Nil
10.5.3	The number of Adjudication Board Members to be appointed is: Nil

PART 2 : DATA TO BE PROVIDED BY CONTRACTOR

REF. CLAUSE No							
1.1.1.9	Name of Contractor:						
1.2.1.2	Address of Contractor:						
	<u>Physical:</u> <u>Postal:</u>						
							
							
	<u>e-mail:</u>						
	<u>Telephone No:</u> <u>Fax No:</u>						
1.1.1.14	Time for achieving Practical Completion of the whole of the Works is: (Max 52 Weeks)						
6.2.1	The security to be provided by the Contractor shall be one of the following: <i>VAT is to be excluded from the Contract Sum/ value of Works for calculating the percentages</i>						
	<table border="1"> <thead> <tr> <th>Type of Security</th><th>Contractor's choice Indicate "Yes" or No"</th></tr> </thead> <tbody> <tr> <td>Cash deposit of 10% of the Contract Sum</td><td></td></tr> <tr> <td>Performance guarantee of 10% of the Contract Sum</td><td></td></tr> </tbody> </table> Note that additional retention in lieu of surety will not be allowed.	Type of Security	Contractor's choice Indicate "Yes" or No"	Cash deposit of 10% of the Contract Sum		Performance guarantee of 10% of the Contract Sum	
Type of Security	Contractor's choice Indicate "Yes" or No"						
Cash deposit of 10% of the Contract Sum							
Performance guarantee of 10% of the Contract Sum							

C1.2.2 AGREEMENT IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT No 85 OF 1993

THIS AGREEMENT is made between

(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: UGU-07-1683-2024, REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 1) 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.

C.2 PRICING DATA

C2.1 PRICING INSTRUCTIONS

1. GENERAL

The Bill of Quantities forms part of the Contract Documents and must be read and priced in conjunction with all the other documents comprising the Contract Documents, which include the Conditions of Tender, Conditions of Contract, the Specifications (including the Project Specification) and the Drawings.

2. DESCRIPTION OF ITEMS IN THE SCHEDULE

The Bill of Quantities has been drawn up generally in accordance with Civil Engineering Quantities 1990 issued by the SA Institution of Civil Engineers.

The short descriptions of the items in the Bill of Quantities are for identification purposes only and the measurement and payment clause of the Standardized Specifications and the Particular Specifications, read together with the relevant clauses of the Project Specification and directives on the drawings, set out what ancillary or associated work and activities are included in the rates for the operations specified.

3. QUANTITIES REFLECTED IN THE SCHEDULE

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

4. PROVISIONAL SUMS

Where Provisional sums or Prime Cost sums are provided for items in the Bill of Quantities, payment for the work done under such items will be made in accordance with Clause 6.6 of the General Conditions of Contract 2015. 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.

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. Any unauthorized changes made by the Tenderer to provisional items in the schedule, or to the provisional percentages and sums in the Summary of the Bill of Quantities, will be treated as arithmetical errors.

5. PRICING OF THE BILL OF QUANTITIES

The prices and rates to be inserted by the Tenderer in the Bill of Quantities shall be the full inclusive prices to be paid by the Employer for the work described under the several items, and shall include full compensation for all costs and expenses that may be required in and for the completion and maintenance during the defects liability period of all the work described and as shown on the drawings as well as all overheads, profits, incidentals and the cost of all general risks, liabilities and obligations set forth or implied in the documents on which the Tender is based.

Each item shall be priced and extended to the "Total" column by the Tenderer, with the exception of the items for which only rates are required, or items which already have Prime Cost or Provisional Sums affixed thereto. If the Contractor omits to price any items in the Bill of Quantities, then these items will be considered to have a

nil rate or price.

All items for which terminology such as "inclusive" or "not applicable" have been added by the Tenderer will be regarded as having a nil rate which shall be valid irrespective of any change in quantities during the execution of the Contract.

The Tenderer shall fill in rates for all items where the words "rate only" appears in the "Total" column. "Rate Only" items have been included where:

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

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

All rates and amounts quoted in the Bill of Quantities shall be in Rands and cents and shall include all levies and taxes (other than VAT). VAT will be added in the summary of the Bill of Quantities.

6. CORRECTION OF ENTRIES

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

7. ARITHMETICAL ERRORS

Arithmetical errors found in the Bill of Quantities as a result of faulty multiplication or addition, will be corrected by the Engineer at the tender evaluation stage, in accordance with the procedure set out in the Tender Data.

8. MONTHLY PAYMENTS

Unless otherwise specified in the Specifications and Project Specifications, progress payments in Interim Certificates, referred to in Clause 6.10 of the General Conditions of Contract 2015, in respect of "sum" items in the Bill of Quantities shall be by means of interim progress installments assessed by the Engineer and based on the measure in which the work actually carried out relates to the extent of the work to be done by the Contractor.

9. UNITS OF MEASUREMENT

The units of measurement described in the Bill of Quantities are metric units for which the standard international abbreviations are used. Non-standard abbreviations which may appear in the Bill of Quantities are as follows:

No.	=	number	PC sum	=	Prime cost sum
%	=	percent	Prov sum	=	Provisional sum

10. PRODUCT NAMES OR SIMILAR APPROVED

Wherever reference has been made to product names, it also includes all similar UDM approved product names. Should alternative products be included, all relevant information to be supplied for approval by UDM.

11. 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

12. 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

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 1 : PRELIMINARY AND GENERAL

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1	SABS 1200 A	SECTION 1 : PRELIMINARY AND GENERAL NOTE: A rate or price must be entered in the amount column for each item. Items which are included should have the word 'included' written in the appropriate amount column.				
1.1.	8	SCHEDULED FIXED-CHARGE AND VALUE RELATED ITEMS				
1.1.1	8.3.1	Contractual Requirements	Sum	1		
1.1.2	8.3.2	Establishment of Facilities on the Site	Sum	1		
1.1.3		Nameboards	No	2		
	8.3.2.2	Facilities for Contractor				
1.1.4		a) Offices and storage sheds	Sum	1		
1.1.5		b) Workshops	Sum	1		
1.1.6		c) Laboratories	Sum	1		
1.1.7		d) Living Accommodation	Sum	1		
1.1.8		e) Ablution and latrine facilities	Sum	1		
1.1.9		f) Tools and equipment	Sum	1		
1.1.10		g) Water supplies, electric power and communications	Sum	1		
1.1.11		h) Dealing with water (Subclause 5.5)	Sum	1		
1.1.12		i) Access (Subclause 5.8)	Sum	1		
1.1.13		j) Plant	Sum	1		
1.1.14	8.3.3	Other Fixed-charge Obligations	Sum	1		
		All work to ensure compliance with the provisions of the OHS Act 85 of 1993 and Regulations R1010 as published in Government Gazette on 18 July 2003. This item shall include all costs to provide a safety plan including the monitoring thereof, auditing thereof and the reporting thereon to the Engineer, on a regular basis.	Sum	1		
1.1.16		All work required to be done for Environmental Management. NB. Exclude topsoiling; compaction of earth berms and grassing etc. as these are individually itemised.	Sum	1		
1.1.17	8.3.4	Removal of Site Establishment	Sum	1		
1.2.	8.4.	SCHEDULED TIME-RELATED ITEMS				
1.2.1	8.4.1	Contractual Requirements	Sum	1		
	8.4.2	Operation and Maintenance of Facilities on Site, for Duration of Construction, except where otherwise stated.				
	8.4.2.1	Facilities for Engineer				
1.2.2		Nameboards	No	2		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
	8.4.2.2	Facilities for Contractor				
1.2.3		a) Offices and storage sheds	Sum	1		
1.2.4		b) Workshops	Sum	1		
1.2.5		c) Laboratories	Sum	1		
1.2.6		d) Living Accommodation	Sum	1		
1.2.7		e) Ablution and latrine facilities	Sum	1		
1.2.8		f) Tools and equipment	Sum	1		
1.2.9		g) Water supplies, electric power and communications	Sum	1		
1.2.10		h) Dealing with water (Subclause 5.5)	Sum	1		
1.2.11		i) Access (Subclause 5.8)	Sum	1		
1.2.12		j) Plant	Sum	1		
1.2.13	8.4.3	Supervision for Duration of Construction	Sum	1		
1.2.14	8.4.4	Company and head office overhead costs for the duration of the contract	Sum	1		
1.2.15	8.4.5	Other time-related obligations	Sum	1		
1.2.16		All work to ensure compliance with the provisions of the OHS Act 85 of 1993 and Regulations R1010 as published in Government Gazette on 18 July 2003. This item shall include all costs to provide a safety plan including the monitoring thereof, auditing thereof and the reporting thereon to the Engineer, on a regular basis.	Sum	1		
1.2.17		All work required to be done for Environmental Management. NB. Include removal of topsoil and exclude compaction of earth berms and grassing etc. as these are individually itemised.	Sum	1		
1.3.	8.7.	DAYWORK				
1.3.1		LABOUR				
		Supervision, transport etc. to be included in P&G allowance. Any other allowance to be included in the rate.				
1.3.1.1		a) Unskilled Labour	hr	400		
1.3.1.2		b) Semi-skilled Labour	hr	300		
1.3.1.3		c) Plumber	hr	200		
1.3.1.4		d) Ganger	hr	50		
1.3.1.5		e) Flagmen	hr	50		
1.3.1.6		f) Foreman	hr	50		
1.3.2		PLANT				
1.3.2.1		a) Grader (CAT 140G or Similar).	hr	50		
1.3.2.2		b) Track Excavator (CAT 235 or similar).	hr	50		
1.3.2.3		c) Vibratory Roller (BOMAG 212 or Similar).	hr	50		
1.3.2.4		d) Pedestrian Roller(Bomag BW 90 or Similar)	hr	50		
1.3.2.5		e) Water Truck(5000litres)	hr	50		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
1.3.2.6		h) Dewatering pump including generator and accessories (50mm pump, 600 l/m)	hr	50		
1.3.2.7		i) Water Truck(5000litres)	hr	50		
1.3.2.8		j) Tipper Truck(10m³)	hr	50		
1.3.2.9		k) Backhoe TLB (CAT 428 or equivalent).	hr	50		
1.3.2.10		l) Dewatering pump including generator and accessories (50mm pump, 600 l/m)	hr	50		
1.3.3		MATERIAL				
1.3.3.1		Actual cost of materials delivered to site inclusive of transport charges. (supporting invoices to be supplied)	Prov Sum	1	450 000.00	450 000.00
1.3.3.2		Percentage adjustment to item 1.3.3.1 for materials	%	450000		
1.4.		COMMUNITY LIAISON OFFICER				
1.4.1		Allowance for CLO reimbursement.	Prov Sum	1	120 000.00	120 000.00
1.4.2		Contractor's markup on item 1.4.1	%	120000		
1.5.		RESIDENT ENGINEER				
1.5.1		Allowance for full-time Engineer on site	Prov Sum	1	650 000.00	650 000.00
1.5.2		Contractor's markup on item 1.5.1	%	650000		
1.6.		STUDENT IN-SERVICE TRAINING				
1.6.1		Allowance for Student in-service Training as provided by UDM	Prov Sum	1	75 000.00	75 000.00
1.6.2		Contractor's markup on item 1.6.1	%	75000		
1.7.		ENVIRONMENTAL CONTROL OFFICER				
1.7.1		Allowance for provision of an Environmental control officer (ECO)	Prov Sum	1	100 000.00	100 000.00
1.7.2		Contractor's markup on item 1.7.1	%	100000		
1.8.		OCCUPATIONAL HEALTH AND SAFETY				
1.8.1		Allowance for provision of an Occupational Health and Safety Officer (OHSO)	Prov Sum	1	120 000.00	120 000.00
1.8.2		Contractor's markup on item 1.8.1	%	120000		
1.8.3		Allowance for provision of an Occupational Health and Safety Auditor	Prov Sum	1	120 000.00	120 000.00
1.8.4		Contractor's markup on item 1.8.3	%	120000		
1.9.		PROVISIONAL SUM FOR USE OF LDV				
1.9.1		Use of LDV (bakkie) including fuel for average travel of 750km/week for use of Engineer or his representative and NLM for the duration of the contract	Prov Sum	1	200 000.00	200 000.00
1.9.2		Contractor's markup on item 1.9.1	%	200000		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 1 : PRELIMINARY AND GENERAL

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
1.10.		PROVISION FOR EPWP				
1.10.1		Extra over sub-item for branding of EPWP PPE	Sum	1		
1.11.		PROVISION FOR TRAINING				
1.11.1		General Skills Training	Person days of Training	100		
1.11.2		Allowance for CEITS skills training of local labour	Prov. Sum	1	100 000.00	100 000.00
1.11.3		Handling cost and profit in respect of sub-item 1.11.3 above.	%	100 000.00		
1.11.4		Training Venue (only if required)	Sum	1		
1.11.5		Transport and accomodation of workers for training where it is not possible to undertake the training in close proximity to the site. (provisional sum)	Prov Sum	1	31 500.00	31 500.00
1.11.6		Handling cost and profit in respect of sub-item 1.11.5 above.	%	31500		
1.12.		TEMPORARY WORKS				
1.12.1		Supply and operate 15 kVa standby generator for continuous work during load shedding	hours	300		
1.13.		CPG MENTORSHIP				
1.13.1		Provide the Provisional Sum to pay for "Enterprise Development Support" of targeted sub-contractors, on an adhoc basis at the sole discretion of Ngwathe Local Municipality.	Prov Sum	1	150 000.00	150 000.00
1.13.2		Handling cost and profit in respect of sub-item 1.13.1 above.	%	150000		
1.14.		GENERAL				
		Tenderer to insert below any items which he wishes specifically to include under the Preliminary and General Section				
1.14.1		a)				
1.14.2		b)				
TOTAL CARRIED TO SUMMARY						

C.23

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 2 : WWTW MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
2		SECTION 2 : WWTW MECHANICAL WORKS				
2.1.		ITEM TO BE DISMANLED/UN-INSTALLED ON SITE AND REMOVED EITHER TO BE REFURBISHED OR SCRAPPED - (Contractor to empty tanks)				
A		TREATMENT TRAIN 1 (TT1)				
2.1.1		1 - Aeration tank				
2.1.1.1		Un-install & load onto truck - 4 x Surface aerators with 22 kW electrical motors & reduction gearbox	no	4		
2.1.1.2		Recover from aeration tank bottom 1 x turbine with shaft & load onto truck	no	1		
2.1.1.3		Transport turbines with shaft to scrap	no	5		
2.1.1.4		Transport electrical motors with gearbox to contractor's workshop for inspection testing and rewiring of electrical motor if feasible	no	4		
2.1.1.5		Allow for rewiring of electrical motors (provisional)	PC Sum	1	80 000.00	80 000.00
2.1.1.6		Contractor's markup on item above	%	80 000		
2.1.1.7		Allow for overhaul & refurbishment of reduction gearbox (provisional)	PC Sum	1	45 000.00	45 000.00
2.1.1.8		Contractor's markup on item above	%	45 000		
2.1.1.9		Transporting to & off loading at municipal mechanical yard in Port Shepstone of refurbished electrical motor & gearbox	Sum	2		
2.1.1.10		Remove existing metal overflow weir at aeration tank and transport to workshop for modification	Sum	1		
2.1.1.11		Up load & transport back to site & off-load	Sum	1		
2.1.2		2 - Suction Lift Clarifiers (2 x) ± 19 m Ø				
		Disassemble & removal from site for refurbishment or to scrap the complete half bridge and sludge removal system				
2.1.2.1		1) Stainless steel handrails to store on site for re-use	m	36		
2.1.2.2		2) Framework with vertical & horizontal pipes & scraper mechanism, with sludge collection tank & siphon pipe to upload to scrap	no	2		
2.1.2.3		3) Drive motor with reduction gearbox & drive wheel to workshop for testing & refurbishment	no	2		
2.1.2.4		4) Bridge structure with side carrier beams - lifting by crane (9 m long) & transport to workshop for refurbishment	no	2		
2.1.2.5		5) Centre spider structural support frame with sludge collection circular tank & electrical slip rings - spider support frame to workshop for refurbishment - collection tank to scrap	no	2		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 2 : WWTW MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
		ITEM TO BE DISMANLED/UN-INSTALLED ON SITE & REMOVED EITHER TO BE REFURBISHED OR SCRAPPED - (civil contractor will empty tanks)				
2.1.2.6		RAS pumpstation Complete removal of Gorman Rupp T7 pumps with electrical motor & frame & upload & transport to workshop for inspection & testing	no	2		
2.1.2.7		Remove inlet & outlet pipework inside PS building for upload and transport to workshop for inspection	sum	1		
2.1.2.8		Allow for complete overhaul of Gorman Rupp pumps, new impeller & bearing assembly and casing sand blasted and re-epoxy (2No.)	PC Sum	1	180 000.00	180 000.00
		Contractor's markup on item above	%	180 000		
2.1.2.9		Allow for new 316L SS Sch 10 inlet pipework with new shut-off valve & non-return valve, flanges	PC Sum	1	290 000.00	290 000.00
		Contractor's markup on item above	%	290 000		
2.1.2.10		Allow for new 316L SS Sch 10 inlet pipework with new shut-off valve & non-return valve, flanges class 1000/3	PC Sum	1	240 000.00	240 000.00
2.1.2.11		Contractor's markup on item above	%	240 000		
2.1.2.12		Allow for new hot dipped galvanized with epoxy coating outlet pipework with new shut-off valve & non-return valve, flanges class 1000/3	PC Sum	1	320 000.00	320 000.00
		Contractor's markup on item above	%	320 000		
B		Treatment Train 2 (TT2)				
2.1.3		1 - Aeration tank				
2.1.3.1		Un-install & load onto truck - 3 x Surface aerators with 22 kW electrical motors & reduction gearbox	no	3		
2.1.3.2		Transport turbines with shaft to scrap	no	3		
2.1.3.3		Transport electrical motors with gearbox to contractor's workshop for inspection testing and rewiring of electrical motor if feasible	no	3		
2.1.3.4		Allow for rewiring of electrical motors (provisional)	PC Sum	1	40 000.00	40 000.00
		Contractor's markup on item above	%	40 000		
2.1.3.5		Allow for overhaul & refurbishment of reduction gearbox (provisional)	PC Sum	1	25 000.00	25 000.00
		Contractor's markup on item above	%	25 000		
2.1.3.6		Allow for transporting to & off loading at municipal mechanical yard in Port Shepstone of refurbished electrical motor & gearbox (provisional)	Sum	1		
2.1.3.7		Allow to remove existing metal overflow weir at aeration tank and transport to workshop for modification	Sum	1		
2.1.3.8		Modify weir to be fully adjustable to suit aerator turbine submerged level adjustment	Sum	1		
2.1.3.9		Remove existing ball & stanchion handrails on the two aerator bridges - upload and transport to scrap	m	40		
2.1.4		2 - Suction Lift Clarifiers (2 x) ± 19 m Ø Disassemble & removal from site for refurbishment or to scrap the complete half bridge and sludge removal system				
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

SECTION 2 : WWTW MECHANICAL WORKS

BALANCE BROUGHT FORWARD					
2.1.4.1	a) Stainless steel handrails to store on site for re-use	m	36		
2.1.4.2	b) Framework with vertical & horizontal pipes & scraper mechanism, with sludge collection tank & siphon pipe to upload to scrap	no	2		
2.1.4.3	c) Drive motor with reduction gearbox & drive wheel to workshop for testing & refurbishment	no	2		
2.1.4.4	d) Bridge structure with side carrier beams - lifting by crane (9 m long) & transport to workshop for refurbishment	no	2		
2.1.4.5	e) Centre spider structural support frame with sludge collection circular tank & electrical slip rings - spider support frame to workshop for refurbishment - collection tank to scrap	no	2		
2.1.5	3 - RAS pumpstation (civil contractor to install subsurface drain)				
2.1.5.1	Remove KSB KWP - F - 150-315 pump with electrical motor & frame & upload & transport to workshop for inspection & testing	no	2		
2.1.5.2	Remove KSB KWP - F - 40-315 (TBC) pump with electrical motor & frame & upload & transport to workshop for inspection & testing	no	2		
2.1.5.3	Allow for complete overhaul of KSB KWP pumps, new impeller & bearing assembly and casing sand blasted and re-epoxy	PC sum	1	160 000.00	160 000.00
2.1.5.5	Contractor's markup on item above	%	160 000		
2.1.5.6	Allow for complete overhaul of KSB sludge pumps, new impeller & bearing assembly and casing sand blasted and re-epoxy	PC sum	1	140 000.00	140 000.00
2.1.5.7	Contractor's markup on item above	%	140 000		
2.1.5.5	PC amount for pipework, fittings & valves	PC sum	1	45 000.00	45 000.00
2.1.5.6	Contractor's markup on item above	%	45 000		
2.2	MANUFACTURE OR ORDER THE FOLLOWING EQUIPMENT				
	1) Equipment at Inlet Works - TT1 & TT2				
2.2.1	600 mm Wide SS 304L drip tray for screenings	no	1		
2.2.2	410 mm x 600 mm 304L SS U-frame and 400 mm x 600 mm 304L SS handstop with handle to replace existing	no	4		
2.2.3	Flow measuring equipment				
2.2.3	a) Open canal Ultrasonic liquid level detector & 304L SS frame for mounting over the canal	no	1		
2.2.4	b) Flow meter transmitter with data logger with connection to MCC & PC in Admin control room	no	1		
2.2.5	c) 304L SS canopy mounted on top of frame over Ultrasonic liquid level detector	no	1		
A	2) Aeration Tanks				
	TT1				
2.2.6	Vertical shaft, surface mount, slow speed surface aerators, complete with gearbox & baseplate for mounting (30 kW motor)	no	4		
2.2.7	316L SS mounting and adjusting bolts & nuts	no	16		
TOTAL CARRIED FORWARD					

CONTRACT No: UGU-07-1683-2024

SECTION 2 : WWTW MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
2.2.8		Ball and stanchion handrails 3CR12-painted	m	5		Rate Only
2.2.9		3CR12, 3 Step bridge landing	no	4		
2.2.10		Oxygen probe complete with 316L SS mounting bracket & cover canopy - submersible trailing cable connection for power & signal transmission	no	2		
2.2.11		316L SS Aeration tank outlet baffle, 3.4 m x 0.6 m, t= 3 mm	no	1		
B	TT2					
		Vertical shaft, surface mount, slow speed surface aerators, complete with gearbox & baseplate for mounting (30 kW motor)	no	3		
2.2.12		316L SS mounting and adjusting bolts & nuts	no	12		
2.2.13		Ball and stanchion handrails 3CR12-painted	m	20		
2.2.14		3CR12, 3 Step bridge landing	no	3		
2.2.15		Oxygen probe complete with 316L SS mounting bracket & cover canopy - submersible trailing cable connection for power & signal transmission	no	2		
2.2.16						
C	TT1 & TT2					
		3 - Suction Lift Clarifiers				
		New half bridge centre bearing assembly (ss where applicable)	no	4		
2.2.17		New sliprings/clarifier - Clarifiers	no	4		
2.2.18		304 L SS Centre sludge transfer tank, siphon, sludge collecting tank and all pipework & scrapers. Pipe work class Sch 10	no	4		
2.2.19		If bridge section & spider support structure are salvageable				
2.2.20		a) Surface preparation to ISO-Sa3, repair minor damage and paint MS9.3 non immersed coastal region - All new-adjustable 316 SS bolts & nuts	no	4		
2.2.21		b) Drive motor fitted with new gearbox and drive wheel	no	4		
2.2.22		To manufacturer and equipped a complete new halfbridge (304L SS) with all the components (excluding SS handrail) (provisional)	no	4		
2.2.23		304L SS V-notch peripheral overflow weir, tmin = 2 mm, W = 250 mm & 316 SS fixing bolts (4 tanks)	m	228		
2.2.24		4 - Chlorination Equipment				
		Chlorination dosing system to dose up to 1.2 kg/Cl2/hour. Dual system, dosing from 2 x 68 kg chlorine cylinders at a time with change over device to parallel 2 cylinders.				
2.2.25		The equipment shall include: a) Vacuum regulators b) Vacuum change over device c) Dosing regulator d) Dosing measurement device e) Ejector f) Ejector booster pump (2 x) g) Chlorine gas detection system (2 x detectors) h) Scale (2 x) i) New ejector booster pump inlet pipework (± 2m from chlorine contact canal) with strainer that can be removed for cleaning j) Outside emergency hand wash basin with shower - SS 316L	sum	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
		5 - Pumpstation: Activated sludge re-circulation (RAS) and sludge draw-off				
		Rates to be used if existing pumps not feasible to refurbish				
		a) TT1				
2.2.26		1) New Gorman Rupp T 4A35B - 7 (existing) (Cornell or Netzsch) self priming surface mount sludge pump complete with electrical motor, V-belt drive and mounting frame - 15 l/s @ 8 m head	no	2		Rate Only
2.2.27		2) New Gorman Rupp, Cornell or Netzsch self priming surface mount sludge pump complete with electrical motor for sludge draw-off, 8 l/s @ H = 16 m	no	2		
2.2.28		3) PC amount for new inlet & outlet pipework at sludge draw off pumps (Included in Item 2.1.2.10)				
		b) TT2				
2.2.29		1) KSB KWP - F - 150-315 pump with electrical motor & frame	no	2		Rate Only
2.2.30		2) KSB KWP - F - 40-315 (TBC) pump with electrical motor & frame	no	2		Rate Only
		3) PC amount for new inlet & outlet pipework at sludge draw off pumps (Included in Item 2.1.2.12)				
2.2.31		Preliminary allowance for replacing corroded pipework beyond repair, valves, instrumentation etc.	PC sum	1	800 000.00	800 000.00
2.2.32		Contractor's markup on item above	%	800 000		
2.3		LOADING, TRANSPORTING EQUIPMENT TO SITE & OFF-LOAD				
		1) Equipment at Inlet Works -TT1 & TT2				
2.3.1		All new & refurbished equipment that includes:	sum	1		
		a) 600 mm Wide SS 304L drip tray for screenings				
		b) 4 x Handstops & frames				
		c) Flow measuring equipment				
		2) Aeration Tanks				
A		TT1				
2.3.2		All new & refurbished equipment that includes:	sum	1		
		a) 4 x Vertical shaft, surface mount, slow speed surface aerators including mounting bolts				
		b) Mounting and adjusting bolts & nuts				
		c) Ball and stanchion handrails				
		d) 4 x Step bridge landing				
		d) 2 x Oxygen probes with mounting equipment				
		e) Aeration tank outlet baffle				
B		TT2				
2.3.3		All new & refurbished equipment that includes:	sum	1		
		a) 3 x Vertical shaft, surface mount, slow speed surface aerators including mounting bolts				
		b) Mounting and adjusting bolts & nuts				
		c) Ball and stanchion handrails				
		d) 3 Step bridge landing				
		d) 2 x Oxygen probes with mounting equipment				
		e) Aeration tank outlet baffle				
C		TT1 & TT2				
		3 - Suction Lift Clarifiers				
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
2.3.4		All new & refurbished equipment that includes: a) 4 x Centre bearing assembly b) 4 x Sliprings c) 4 x Centre sludge transfer tank, siphon, sludge collecting tank and all pipework & scrapers d) Refurbished bridge section & spider support structure e) 4 x Drive motor/gearbox & drive wheel f) 4 x Siphon vacuum pump Alternative: Complete new halfbridge with all the components (provisional)	sum	1		
2.3.5			no	4		Rate Only
2.3.6		V-notch peripheral overflow weir & fixing bolts	m	228		
2.4		4 - Chlorination Equipment				
2.4.1		Complete chlorination dosing system	Sum	1		
2.5		5 - Pumpstation ☒ RAS pumps TT1				
2.5.1		a) 2 x Gorman Rupp T 4A35B - 7 & pipework TT2	sum	1		
2.5.2		a) 2 x KSB KWP - F - 150-315 pump & pipework ☒ Sludge draw-off pumps TT1	sum	1		
2.5.3		a) 2 x Gorman Rupp/Cornell/NETZSCH & pipework TT2	sum	1		
		a) 2 x KSB KWP - F - 40-315 pump & pipework	sum	1		
2.6		INSTALLATION OF EQUIPMENT ON SITE 1) Equipment at Inlet Works				
2.6.1		600 mm Wide SS 304L drip tray for screenings	no	1		
2.6.2		Flow measuring equipment	sum	1		
		2) Aeration Tanks TT1				
2.6.3		Aerators, level & adjust	no	4		
2.6.4		Ball and stanchion handrails	m	10		Rate Only
2.6.5		3 Step bridge landing	no	4		
2.6.6		Oxygen probes with mounting equipment	no	2		
2.6.7		Aeration tank outlet baffle	no	1		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 2 : WWTW MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
B		TT2				
2.6.8		Aerators, level & adjust	no	3		
2.6.9		Ball and stanchion handrails	m	20		Rate Only
2.6.10		3 Step bridge landing	no	3		
2.6.11		Oxygen probes with mounting equipment	no	2		
2.6.12		Aeration tank outlet baffle	no	1		
C		TT1 & TT2				
		3 - Suction Lift Clarifiers				
2.6.13		Complete bridge & all accessories	no	4		
2.6.14		Alternative: Complete new halfbridge with all the components (provisional)	no	4		Rate Only
2.6.15		V-notch peripheral overflow weir ± 57 m/tank	no	4		
		4 - Chlorination Equipment				
2.6.16		Complete chlorination dosing system	Sum	1		
		5 - Pumpstation				
		☐ RAS pumps				
		TT1				
2.6.17		Gorman Rupp T 4A35B - 7 with electrical motor, V-belts on mounting frame & pipework.	sum	1		
		☐ RAS pumps				
		TT2				
2.6.18		2 x KSB KWP - F - 40-315 pump & pipework	sum	1		
		☐ Sludge draw-off pumps				
		TT1				
2.6.19		2 x Gorman Rupp/Cornell/NETZSCH & pipework	sum	1		
		TT2				
2.6.20		2 x KSB KWP - F - 40-315 pump & pipework	sum	1		
2.7		Commissioning & Testing of Installed Equipment				
		1) Equipment at Inlet Works				
2.7.1		Flow measuring equipment	sum	1		
		2) Aeration Tanks				
A		TT1				
2.7.2		Aerators - Dry run & commissioning	no	4		
2.7.3		Oxygen probes	no	2		
TOTAL CARRIED FORWARD						

C.30

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 2 : WWTW MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
B		TT2				
2.7.4		Aerators - Dry run & commissioning	no	3		
2.7.5		Oxygen probes	m	2		
		3 - Suction Lift Clarifiers				
2.7.6		Bridge rotation, electrical control & siphon working - suction scraper floor clearance	no	4		
2.7.7		Alternative: Same as in 6.6	no	4		Rate Only
2.7.8		Verify level of V-notch peripheral overflow weir	no	4		
		4 - Chlorination Equipment				
2.7.9		Commission, test & monitor	sum	1		
		5 - Pumpstation				
		☒ RAS pumps				
		TT1				
2.7.10		Dry run test	sum	1		
2.7.11		Commission, test & monitor	sum	1		
		TT2				
2.7.12		Dry run test	sum	1		
2.7.13		Commission, test & monitor	sum	1		
		☒ Sludge draw-off pumps				
		TT1				
2.7.14		Dry run test	sum	1		
2.7.15		Commission, test & monitor	sum	1		
		TT2				
2.7.16		Dry run test	sum	1		
2.7.17		Commission, test & monitor	sum	1		
2.7.18		Provision for monitoring & adjustments after commissioning				
2.7.19		Qualified mechanical technician to monitor, adjust where necessary and replace all process equipment on site	days	10		
2.7.20		Accommodation costs for technician	days	12		
2.7.21		Travelling costs	km	1 200		
2.7.22		Compile and supply 3 complete sets of data sheets and operational manuals	sum	1		
2.7.23		Supply electronic copy & 2 sets hard copies of AS BUILT information	sum	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
3.2		LEVEL SENSOR , SWITCHES & SENSOR CABLING Etc. a) Supply and install the IFM or similar approved level sensor as specified in the pump sumps and dosing tanks for level display and pump low level trip with mounting bracket etc complete b) Supply and install the low level cut-out float switches and pump start-stop float switches complete with s/steel rods , chain and weights c) Supply and install electronic IFM or similar approved no-flow switches for all the pumps and dosing pumps protection complete with stop cock and socket welded to pipe d) Proximity Switch (to indicate which poly dosing tank is operational) e) 40 dia solenoid valves as specified f) Solenoid switch as specified g) Limit switch AC/DC or similar approved h) Dissolved Oxygen Sensors (DO Sensors) with s/steel mounting brackets and WP enclosure 1) Blower air pressure sensors installed on the air delivery pipe with sockets and all fittings complete j) Blower air flow meters installed on the blower delivery pipe with sockets and all fittings complete k) Modbus cabling between the MCC PLCs and SCADA switch at control room (armoured in ground) l) Termination of modbus or fibre optic cabling including termination kit , splicing etc m) CAT 6 Ethernet cable 1,5mm ² 4 pair screened cable n) Termination of ethernet cable o) Fibre optic cable 4 pair single mode p) Fibre optic cable terminations , splicings etc q) Connect , interface , programme , test and commission the PLC for the above level sensor , instruments and control systems and interface to SCADA system complete r) Stainless steel level electrdes as specified for control of pumps (auto start and stop)	Sum Set Sum No No No No No No No m No. m No m No Sum No	4 4 6 1 3 6 3 4 1 1 300 4 300.00 16 300 16 1 4		
3.3		FLOW METERS Supply and deliver to site the following flow meters : a) 200 dia mag flow meter as specified on RAS pumping line b) 250 dia mag flow meter as specified on the WAS pumping line Install and connect up the flow meters supplied above as follows : a) 200 dia mag flow meter as specified on RAS pumping line b) 250 dia mag flow meter as specified on the WAS pumping line	Sum Sum Sum Sum	2 2 2 2		
3.4		CABLES				
3.4.1		a) Supply Cables PVC/SWA/PVC/ECC cables per SANS 1507 (a) 1,5mm ² x 3 core ECC (b) 1,5mm ² x 4 core ECC (c) 2,5mm ² x 3 core ECC (d) 2,5mm ² x 4 core ECC (e) 10mm ² x 3 core ECC (f) 16mm ² x 4 core ECC (g) 16mm ² x 3 core ECC (h) 25mm ² x 4 core ECC (i) 35mm ² x 4 core ECC (j) 95mm ² x 4 core ECC (k) 240mm ² x 4 core ECC	m m m m m m m m m m m	150 150 200 200 650 130 75 110 200 80 750		
TOTAL CARRIED FORWARD						

CONTRACT No: UGU-07-1683-2024

SECTION 3 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
3.6.1.6		f) Surface 2 way light switch	No.	2		
3.6.1.7		g) 20A DP 2 pole isolators	No.	4		
3.6.1.8		f) 16 Amp zone 2 EXE rated 16A switched socket outlet	No.	4		
3.6.1.9		w) Zone 2 EXE rated terminal junction box	No.	16		
3.6.1.10		y) DBs for all pump stations and other treatment plant buildings as specified	No.	6		
3.6.2		c) Conduits , fittings , wiring, saddles , accessories etc complete for all the structures and building lighting and power points				
		i) 25 dia PVC conduit	m	120		
		ii) 25 dia galvanised conduit	m	100		
		iii) 25 dia galvanised round boxes with covers	m	20		
		iv) 100 x 50 galvanised box with covers	m	20		
		v) 100 x 100 galvanised box with cover	No.	2		
		vi) 32 dia PVC conduit in floor and surface with bends etc	m	60		
		vii) 1,5mm ² wires	No.	400		
		viii) 2,5mm ² wires	m	380		
		viii) 4mm ² wires	m	150		
		x) 40 x 40 galvanised trunking with covers fixed to wall or suspended from roof or trusses etc	m	120		
3.6.3		Supply light fittings / luminaries and poles as specified with lamps (refer to project specification for details)				
		a) Type A - 1,5m 2 Tube 2 X 30W LED corrosion proof	No.	30		
		b) Type B - Surface Bulkhead Aluminium with glass bowl 1 x 18W LED	No.	24		
		c) Type C - 1,5m 2 Tube 2 x 30W LED EXE Rated Zone 2	No.	10		
		d) Type D - Floodlight with aluminium body 1 x 100W LED	No.	4		
3.6.4		Install and connect the light fittings and poles supplied above.				
		a) Type A	No.	30		
		b) Type B	No.	24.00		
		c) Type C	No.	10.00		
		d) Type D	No.	4.00		
		Supply and install photo cell to control outside lights	No	4.00		
		Weatherproof termination boxes for instruments etc (with DIN rail, terminals etc.)	No	6.00		
		Disconnect , make safe , strip , remove and deliver the existing damaged or non-compliant MCCs on site and deliver to UGU Stores	No	6.00		
3.7		MCC & DISTRIBUTION BOARDS				
3.7.1		Supply and install distribution boards, motor control panel etc. complete with doors where applicable, frames, subframes, chassis, fixtures, fittings, circuit breakers spare space, busbar etc. as per specifications and drawings/schematics where provided to SANS 1765 (to include contractor to provide wiring diagrams , PLC I/O lists and wiring diagrams , loop & cable diagrams etc as specified)				
		a) MCC Main Panel- 01 as specified (with PLC & HMI)	Sum	1.0		
		b) MCC 02 Ex Aerators & Clarifiers Stream TT1 (with PLC only)	Sum	1.0		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 3 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
BALANCE BROUGHT FORWARD							
3.7.2		c) MCC - 03 New Waste Recycling Pump (with PLC only)	Sum	1			
		d) MCC - 04 New Sludge Return Pumps (with PLC only)	Sum	1			
		e) MCC - 05 New Blower MCC (with PLC & HMI)	Sum	1		Rate Only	
		f) MCC - 14 New TT3 Inlet Works Screens & Conveyor (with PLC only)	Sum	1			
		g) MCC - 08 New Sludge Dewatering Plant & Equipment (with PLC only)	Sum	1			
		Supply and install PLC as specified complete	Sum	1		Rate Only	
		Supply and install HMI as specified complete	Sum	1		Rate Only	
		Design and submit wiring and layoout drawings for all MCCs and DBs. To include P & ID diagrams , parts and equipment list, PLC I/O lists , cable schedules and cable block diagrams , instrument lists, instrument loop diagrams etc complete	Sum	1			
		Factory Acceptance tests (FAT) for all the above MCCs & DBs etc. supplied above including for costs for Engineer to attend	Sum	1			
		Allow for cost of Engineer to attend FAT & SAT as above and for Engineers travel costs to site and other venues	Sum %	1 90 000.00	90 000.00	90 000.00	
3.8		Allow for profit and attendance on above item					
		Allow for the SAT , and test and commission the MCC , electrical and instrumentation installation supplied above including the automation of controls , flow switches and level sensors etc complete	Sum	1			
		SOLAR POWER					
		Supply , deliver, install and connect up the following :					
		a) Solar panels with frame and stand-alone supporting structure over drying beds - to power 2 x 30kW arearors and 5kW of site lighting (Total 65kW) Off grid system	Sum	1.00		Rate Only	
		b) Solar batteries (lithium iron type) complete with cabling etc	Sum	1.00		Rate Only	
		c) Solar charge controller	Sum	1.00		Rate Only	
		d) Solar power inverter complete (Off grid system)	Sum	1.00		Rate Only	
		e) Solar power cabling complete	Sum	1.00		Rate Only	
		f) Solar power DB	Sum	1.00		Rate Only	
3.9		g) Test and commission and provide solar power O & M manuals, COC and compliance and hand over data sheets complete	Sum	1.00		Rate Only	
		h) Supply and install the steel structure for supporting the solar panels over the sludge drying beds as specified	Sum	1.00		Rate Only	
		SECURITY AND CAMERA SYSTEMS					
		a) Supply and install a wireess security camera system around the site perimeter including monitoring system/PC , all hardware , software and programming, keyboard and 40" monitor screen with battery back up system in the control room/security office . Allow provisional sum of R 500 000,00	Sum	1.00 500000.0	500 000.00	500 000.00	
		b) Allow for profit and attendance on above item	%				
	3.10.		TELEMETRY SYSTEM -WWTW				
			Supply, install , test and commission the following to UGU standards and specifications				
			a) Telemetry panel at the WWTW site	Sum	1.0		
			b) Telemetry RTU , digital radios etc	Sum	1.0		
			c) Telemetry batteries - 100A/hr	No	2		
		d) Webb radio antennae and associated cabling, mounting and accessories etc complete	Sum	2			
		e) DC surge protection and optical isolation between serial devices	Sum	1			
TOTAL CARRIED FORWARD							

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
3.13		EXTRACT FANS				
		a) Luft or similar and equal approved extract fans type Luft LPA 500/43F 380Volt 2m³/s with WC500 wall cowl cladding	No.	4.0		
		b) Create opening in brickwork and side cladding for above fan , patch up, waterproof and make good	No.	4.0		
		c) EXE rated extractor fans and cowls similar to as supplied above type Luft 500/43F EXE with WC500 wall cowl above as specified	No.	1		
		d) Connect the ventilation fans to their respective electrical isolators or power points	No.	4		
		e) Test and commission the ventilation fans supplied above	Sum	1		
		Lump sum labelling for all instruments, actuators, level sensors , flow switches , level switches etc complete	Sum	1		
		Allow for other statutory and standard signage , labels and notices for all processes and buildings	Sum	1		
		Allow a provisional sum of R 50 000,00 for any unforeseen work to be used entirely at the discretion of the Client and Engineer	Sum	1		
3.14		FIRE PROTECTION AND SIGNAGE				
		a) 9 kg DCP fire extinguisher	No.	8		
		c) Photo luminescent and standard FE signs	No.	8		
		d) Warning - machine starts automatically signage	No.	8		
		e) Warning - electricity danger and no entry signage	No.	8		
		e) Number plate type signage and labels for dosing pumps etc	No.	20		
		Allow a provisionsl sum of R260 000,00 for any unforeseen items to be used entirely at the discretion of the Engineer or Client	Sum	1	260 000.00	260 000.00
3.15		Allow for profit and attendance on item above	%	260 000.00		
3.16		Any other item the tenderer considers has been omitted and requires pricing as separate items as follows : a) b)				
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 4: WWTW CIVIL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
4		SECTION 4: WWTW CIVIL WORKS				
4.1		CRANE HIRE				
		Provisional allowance for crane hire (5 t, 15 m arm)				
4.1.1		1) To remove half bridge from clarifiers	no	4		
4.1.2		2) To re-install half bridge on clarifiers	no	4		
4.2		TEMPORARY WORKS				
4.2.1		1) Shut TT1 - Temporary handstop, pipe prop or sand bags - provisional - final proposal - Rev1	sum	1		
4.2.2		2) Hire or supply a temporary submersible sludge pump ($\pm 15 \text{ t/s}$ @ 8 m head) with 100 m, 150 mm $\varnothing$, lay flat hose for 6 months (provisional)	sum	1		
4.2.3		3) Supplying contractors dewatering pump with 100 m lay flat hose (100 mm $\varnothing$)	sum	1		
4.2.4		4) Supply and operate when required a 30 kVa standby generator for continuous work during load shedding (provisional)	hours	200		
4.2.5		5) Shut TT2 - Temporary handstop, pipe prop or sand bags - provisional - final proposal - Rev1	sum	1		
4.3		SLUDGE HANDLING & DISPOSAL				
4.3.1		Construction phase 1 - Shut down TT1				
4.3.1.1		1) Divert all the incoming flow to TT2 - Also flow split from TT3 to TT2	sum	1		
4.3.1.2		2) Create sump area for sludge pump 1.2.4 2) MH rings - provisional	sum	1		
4.3.1.5		3) Empty aeration basin TT1 to spoil/sludge drying beds	m ³	1950		
4.3.1.6		4) Empty clarifier No 2, TT1 to spoil/sludge drying beds	m ³	1100		
4.3.1.7		5) Empty clarifier No 2, TT1 to spoil/sludge drying beds	m ³	650		
4.3.1.8		6) Empty sump at RAS PS at TT1 to spoil/sludge drying beds	m ³	50		
4.3.1.9		7) Allow for unblocking sludge pipes & remove sludge	m	100		
		8) Remove sludge from drying beds & spoil	m ³	150		
4.3.2		Construction phase 2 - Shut down TT2				
4.3.2.1		Divert all the incoming flow to TT1 - Also flow split from TT3 to TT1	sum	1		
4.3.2.2		Empty aeration basin TT2 to spoil/sludge drying beds	m ³	1850		
4.3.2.3		Empty clarifier No 1 & No 2, TT2 to spoil/sludge drying beds	m ³	1300		
4.3.2.4		Empty sludge draw-off tank & sump and spoil/sludge drying beds	m ³	60		
4.3.2.5		Allow for unblocking sludge pipes & remove sludge (sludge pipes - tank to RAS pumps-blocked)	m	100		
4.3.2.6		Supply lime for odor control	t	2		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
BALANCE BROUGHT FORWARD							
4.3.2.17	SABS 1200 DB	Spread lime over fresh sludge at drying beds - labourers with gum boots & protective clothing	hour	40			
4.3.2.18		Remove dried sludge from drying beds and dispose of at approved site	m³	180			
4.3.3		SECTION 3: EARTHWORKS					
		Hand excavation at structures & pipes					
		At TT1					
4.3.3.1		a) At aeration basin to expose inlet pipe	m³	12			
4.3.3.2		b) At aeration basin to expose RAS circulation	m³	3			
4.3.3.3		c) At aeration basin to relay RAS circulation to inlet	m³	7			
4.3.3.4		d) At RAS PS to exposed inlet pipework	m³	10			
		At TT2					
4.3.3.5		a) At aeration basin to expose inlet pipe	m³	12			
4.3.3.6		b) At aeration basin to expose RAS circulation	m³	3			
4.3.3.7		c) At aeration basin to relay RAS circulation to inlet	m³	6			
4.3.3.8		d) At sludge draw-off sump to exposed pipework	m³	10			
4.3.3.9		e) Between sedimentation tanks - overflow leak	m³	12			
		At TT3					
4.3.3.10		a) Before inlet works to expose inlet pipe from PS 3	m³	12			
4.3.3.11		At chlorination tank to expose services	m³	12			
4.3.3.12		Excavate in all material (restricted)					
4.3.3.13		For extension of sump TT1 - RAS PS	m³	60			
4.3.3.14		For extension of chlorine contact canal	m³	30			
4.3.3.15		For extension of inlet canal at inlet works TT3	m³	50			
4.3.3.16		Pipe Trenches					
4.3.3.17		800 mm Wide x 2 m deep (1.6 m³/m)	m	300			
4.3.3.18		Hand excavation where trench cross existing services	m³	50			
		TREATMENT TRAIN 1 = TT1 - 2 Mℓ/day TREATMENT TRAIN 2 = TT2 - 1.8 Mℓ/day 2					
4.4		SABS 1200 GA	CONCRETE (small works - Special - small quantities and difficult accesability)				
4.4.1			Inlet works - TT1 & TT2				
		Breakout existing handstop frames & install new handstops and frames as supplied by Mechanical contractor	no	8			
4.4.1.1							
4.4.1.2		Level corroded concrete floor area with Pro-Struct 513 levelling mortar or Sika equivalent	kg	100			
4.4.1.3		Fill severely corroded concrete venturi side walls with Pro-Struct 514 repair plaster/Sika equivalent	kg	50			
4.4.2		Aeration tank - TT1 Mechanical contractor to remove aerators					
4.4.2.1		Expose concrete surface by sandblasting or cleaning with high pressure water jet	m²	900			
4.4.2.2		Chip out severe cracking in wall & floors and clean (provisional length)	m	100			
4.4.2.3		Fill cracks with Pro-Struct 525/Sika equivalent	kg	350			
4.4.2.4		Plaster inside wall with Pro-Struct 514/Sika equivalent, average 4 mm thick	m²	400			
TOTAL CARRIED FORWARD							

C.40

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 4: WWTW CIVIL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
4.4.2.5		Pro-Struct 514	kg	1500		
		Concrete work 30/19 Mpa				
4.4.2.6		Minor modifications at concrete bridges where aerators are mounted	m³	1		
4.4.2.7		Concrete cross stubs for concrete draught tubes	m³	1		
4.4.2.8		Drill into concrete floor to install Y 12 dowels 120 mm deep x 15 mm Ø	no	48		
4.4.2.9		Core 100 mm Ø pockets, 150 mm deep for holding down bolts for aerators (provisional)	no	16		
		Formwork (smooth- class ii)				
		1) Vertical				
4.4.2.10		a) 100 mm Wide in concrete cross stubs	m²	1		
4.4.2.11		b) 400 mm Wide in concrete cross stubs	m²	6		
4.4.2.13		c) 100 mm -300 mm wide in small repairs	m²	5		
		2) Horizontal				
4.4.2.14		a) In bridges	m²	10		Rate Only
4.4.2.15		3) Pockets for holding down bolts	no	16		
4.4.2.16		High tensile reinforcing steel	t	1		
4.4.2.17		Grout dowel bars into floor	no	48		
4.4.3		Aeration tank - TT2				
		Mechanical contractor to remove aerators				
4.4.3.1		Expose concrete surface by sandblasting or cleaning with high pressure water jet	m²	900		
4.4.3.2		Chip out severe cracking in wall & floors and clean (provisional length)	m	100		
4.4.3.3		Fill cracks with Pro-Struct 525/Sika equivalent	kg	350		
4.4.3.4		Plaster inside wall with Pro-Struct 514/Sika equivalent, average 4 mm thick	m²	400		
4.4.3.5		Pro-Struct 514	kg	1500		
		Concrete work 30/19 Mpa				
4.4.3.6		New centre columns slab	m³	4		
4.4.3.7		New centre columns	m³	1		
4.4.3.8		Modify bridges	m³	6		
		Formwork (smooth- class ii)				
		1) Vertical				
4.4.3.9		a) 200 mm Wide in floor & bridges	m²	12		
4.4.3.10		b) 400 mm Wide	m²	15		
4.4.3.11		c) 300 mm wide in columns	m²	5		
		2) Horizontal				
4.4.3.12		a) In bridges	m²	16		Rate Only
4.4.3.13		3) Pockets for holding down bolts	no	24		
4.4.3.14		High tensile reinforcing steel	t	1		
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 4: WWTW CIVIL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
4.4.4		Other Structures 30/19 Mpa In other structures				
4.4.4.1		Chlorination tank	m³	40		
4.4.5.1		Extension of sump at RAS PS TT1	m³	9		
4.4.5.2		Concrete roofs on buildings	m³	1		
4.4.5.3		30 Mpa/19 mm concrete Column footings	m³	4		
4.4.5.4		20 Mpa/19 mm concrete Strip footings, floorslab & cable ducts	m³	6		
4.4.5.5		FINISHES TO UNFORMED CONCRETE Woodfloat finish	m²	10		
4.4.5.6		Steel trowel finish, horizontal surfaces	m²	60		
4.4.5.7		FORMWORK Vertical a) Staight Horizontal under slabs	m²	270		
4.4.5.8		a) Staight	m²	20		
4.4.6		PROVISIONAL COST ITEMS				
4.4.6.1		Repairs & refurbishment at building structures	Prov Sum	1	160 000.00	160 000.00
4.4.6.2		Allow for profit and attendance on item above	%	160 000.00		
4.4.6.3		Subsurface drain at RAS PS TT2 a) Trench excavation (800 mm x 1.2 m deep)	m	25		
4.4.6.4		b) Bedding material	m³	6		
4.4.6.5		c) Geofabric (Bidem grade A2) supplied & laid	m²	80		
4.4.6.6		d) 19 mm washed graded stone	m³	12		
4.4.6.7		e) Slotted 110 mm Ø HDPE drain pipe	m	25		
4.4.6.8		f) Surplus excavation to spoil or formoring terrace	m³	12		
4.4.6.9		Pipework: Replace, supply new and install	Prov Sum	1	800 000.00	800 000.00
4.4.6.10		Allow for profit and attendance on item above	%	800 000.00		
4.4.6.11		Draft tubes in aeration tanks Supply & deliver to site 750 mm concrete MH sections, 2.5 m lengths to be used as draft tube under aerators	no	7		
4.4.6.12		316L Stainless steel brackets, 800 mm long, twisted 90° at 400 mm, 60 mm wide, t = 4. 2 x 14 mm Ø holes top & bottom section for 4 x 4 x 12 mm Ø 316 SS anchor bolts	no	28		
4.4.6.13		50 mm long x 12 mm Ø, 316 SS anchor bolts	no	112		
4.4.6.14		Secure MH sections to cross concrete support with anchor bolts (approved apoxy grouting)	no	112		
4.4.6.15		Cutting and altering incoming pipe lines at inlet works TT3	sum	1		
4.4.6.16		Construct a new canopy structure at inlet works TT3	Prov Sum	1	240 000.00	240 000.00
4.4.6.17		Allow for profit and attendance on item above Provision to supply coarse bubble aeration, 100 NB galvanised pipe section drilled with double row 6 mm Ø holes 150 h/h and side channel blower	%	240 000.00		
4.4.6.18			Prov Sum	1	350 000.00	350 000.00
4.4.6.19		Allow for profit and attendance on item above	%	350 000.00		
TOTAL CARRIED TO SUMMARY						

SECTION 5 : PUMPSTATIONS ELECTRICAL AND INSTRUMENTATION

[illegible]

SECTION 5 : PUMPSTATIONS ELECTRICAL AND INSTRUMENTATION

TOTAL CARRIED FORWARD	
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ITEM	REF	DESCRIPTION
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ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
5.2		SMALL POWER DISTRIBUTION BOARDS, MCC & ANCILLARIES				
5.2.1		MOTOR CONTROL PANELS				
		Supply and install distribution boards, motor control panel etc. complete with doors where applicable, frames, subframes, chassis, fixtures, fittings, circuit breakers spare space, busbar etc. as per specifications and drawings/schematics where provided to SANS 1765 (to include contractor to provide wiring diagrams , PLC I/O lists and wiring diagrams , loop diagrams etc as specified)				
		a) MCC 09 - Pump Station Margate 4A	Sum	1		
		b) MCC 11 - Pump Station Margate 1	Sum	1		
		c) MCC 12 - Pump Station Margate 1A	Sum	1		
		d) MCC 13 - Pump Station Margate 3A	Sum	1		
		e) Make safe, disconnect , remove and transport to UGU Stores the existing MCCs from Pump Stations 1, 1A , 3A & 4A	No	4		
		f) SCADA UPS DB - 01 in control room	No.	1		
		g) Factory Acceptance tests (FAT) for all the above MCCs, electrical panels, DB's, etc. supplied above including for costs for Engineer to attend (paid directly for Engineer costs)	Sum	1		
		h) Allow a provisional sum of R 55 000,00 for the Engineer to attend all FATs for all motor control panels and other electrical and associated equipment (paid directly for Engineer costs)	Sum	1	55 000.00	55 000.00
		i) Allow for profit and attendance on provisional sum above	%	55000		
		j) Allow a sum to prepare wiring diagrams and component lists for comment and approval for all MCC's, electrical panels, DB's etc. supplied above. (all 4 pump stations)	Sum	1		
		k) Allow a sum to prepare the FDS, P & ID diagrams, I/O lists and wiring diagrams, instrument loop diagrams, cable schedule and block diagrams, network and process diagrams etc complete for all MCCs , control , automation and PLC systems ,etc supplied above as specified for the entire project for all 4 (four) pump stations	Sum	1		
5.2.2		CABLE TRAYS & ACCESSORIES				
		Supply and installation of heavy duty hot dipped galvanized perforated cable tray with 76mm high turn including splicers etc. The rate shall include for the fixing of cable tray against walls in a horizontal position from the soffit above by means of M8mm threaded metal rods hangers with anchor bolts at intervals not exceeding 1000mm.				
		a) 100mm cable trays straight	m	40		
		b) 100mm cable tray bend and tees	No.	4		
		c) 150mm cable trays straight	m	40		
		d) 150mm cable tray bend and tees	No.	4		
		e) 200 mm cable ladder	m	40		
		f) 200mm cable ladder bends	No.	4		
		g) 300 mm cable ladder	m	40		
		h) 300mm cable ladder bends	No.	4		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
5.2.3		ISOLATORS FOR ANCILLIARY EQUIPMENT				
		Supply, installation and connection of isolator in IP65 slide extension box complete with box				
		a) 20 Amp 3 pole	No.	4		
		b) 30 Amp 3 pole	No.	4		
		c) Emergency Stop buttons + stands corrosion proof s/steel	No.	1		
		Supply and install the following instrument cabling and terminations. Ethernet cabling to be CAT6E industrial grade				
		d) 1.5 mm ² Twisted pair cables - 6 Core	m	180		
		e) 1.5 mm ² Twisted pair cables - 6 Core Terminations	No.	20		
		f) Modbus cabling	m	40		
		g) Modbus terminations/ends	No.	8		
		h) Fibre optic cabling 6 pair single mode	m	25		
		i) Fibre optic cabling terminations/splicing	No.	4		
		j) Cable baskets - 150mm	m	20		
		k) Weatherproof termination boxes for pump station instruments with DIN rail, terminals etc.)	No.	16		
		l) Weatherproof termination boxes with DIN rail, terminals and surge protection arrestors for flow meter cabling	No	2		
5.3		TELEMETRY				
		TELEMETRY SYSTEM -WWTW				
		Supply, install , test and commission the following to UGU standards and specifications				
		a) Telemetry panel at the pump stations sites (4 sites + control room)	Sum	5		
		b) Telemetry RTU , digital radions etc (4 sites + control room)	Sum	5		
		c) Telemetry batteries - 100A/hr	No	8		
		d) Webb radio antennae and associated cabling, mounting and accessories etc complete (4 sites)	Sum	4		
		e) DC surge protection and optical isolation between serial devices (4 sites)	Sum	4		
		f) Configuration , testing and commissioning of telemetry system and instrumentation (4 sites)	Sum	4		
		g) Integrate telemetry system to UGU SCADA system at UGU Control Room and on-site system including all hardware, software and integration between all MCCs , PLCs and telemetry panel (for all 4 pump stations)	Sum	1		
		h) Supply O & M manuals, wiring diagrams, compliance certificates and hand-over data pack for complete telemetry system (for all 4 pump stations)	Sum	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
5.4		INSTRUMENTATION, SCADA & PLC SYSTEM				
5.4.1		INSTRUMENTATION				
		Instrumentation to be as per drawings, schematics, loop diagrams and to comply with UGU DM or industry standard specifications. Instrumentation to include all necessary sensors, transmitters, controllers and accessories to provide thorough and accurate analysis/control. All Instrumentation to be MODBUS ready unless otherwise stated. Instrumentation make & model to be same or equivalent and to be approved by the Engineer prior to purchase.				
		a) IF-M or similar and equal approved level transmitter with transducer/sensor (0-10m Range) with 10m cabling including mounting brackets, mounting arms and all other necessary accessories (Transmitter installed in MCC or in separate panel in buildings/pump stations)	No.	1		
		b) Siemens or similar approved M200 or similar and equal approved ultrasonic level transmitter (0-10m range) complete with Siemens Echomax XPS0-101 R sensor , remote transmitter with mounting brackets, mounting arms amd all necessary accessories. (linked to PLC)	No	3		
		c) Limit switch AC/DC or similar approved	No	4		
		d) Supply and install the IFM or similar and equal approved electronic no-flow switches with half inch sockets welded to pump delivery pipe as specified (for new raw water and other pumps)	Sum	10		
		e) Supply and install low level cut-out float switches in sumps with s/s chain, weights etc as specified	No	4		
		f) Supply and install level electrodes in sumps for low level cut-out of pumps as specified	No	4		
		SCADA & PLC system to comply with UGU specifications and drawings.PLC to be fully compatible with SCADA package. SCADA & PLC to be same or equivalent and to be approved by Engineer prior to purchase.				
		g) Allow a provisional sum of R 175 000,00 to upgrade and re-programme the existing SCADA system in the UGU Control Room to include all the pump status from the 4 sewer pump stations (by certified system integrator for the equipment supplied).	Prov Sum	1	175 000.00	175 000.00
		h) Allow for profit and attendance on above item	%	175000		
		i) Allow an provisional amount of R 75 000,00 for the modifications of the control systems for the operation of the 4 sewer pump stations	Sum	1	75 000.00	75 000.00
		j) Allow for profit and attendance on item above	%	75000		
		k) UPS- 3kVA for PLC System in each MCC as specified	Sum	4		
		l) Allow a sum for a PLC/SCADA System Integrator for programming of the all the new PLCs and for the new and existing SCADA systems	Sum	1		
TOTAL CARRIED FORWARD						

SECTION 5 : PUMPSTATIONS ELECTRICAL AND INSTRUMENTATION

BALANCE BROUGHT FORWARD					
5.4.2		SECURITY			
		a) Supply, install, test and commission an automatic pepper spray system complete for each pump station	Sum	4	
		b) Supply, install, test and commission a CCTV & surveillance camera system complete for each pump station	Sum	4	
		c) Integrate the pepper spray system and CCTV system to the PLC, telemetry and SCADA monitoring system at the UGU Control Room	Sum	1	
		d) Supply all test certificates, COCs, compliance certificates, O & M manuals and hand-over data packs for the pepper spray and CCTV systems supplied above	Sum	1	
5.5		LIGHTING, SMALL POWER & SOCKET			
5.5.1		LIGHTING, SMALL POWER & SOCKETS			
		Supply and Install the following :			
		a) Flush 1 lever light switch	No.	4	
		b) Surface 1 lever light switch	No.	8	
		c) Flush 16A Switched socket outlet	No.	1	
		d) Surface 16A Switched socket outlet	No.	8	
		e) 16A Switched socket outlet industrial type surface	No.	4	
		f) Weatherproof termination boxes CCG Corruguard or similar for actuated valves and instruments with terminals	Sum	4	
		g) Surface 2 way light switch	No.	4	
		h) 20A DP 2 pole isolators for air-conditioning units and extract fans.	No.	4	
		i) 32 TP +N and earth welding socket plug surface Ampco or similar approved (cable measured elsewhere)	No.	4	
		j) 10A DP surface weatherproof rotary lockable isolators		4	
		k) 10A TP surface weatherproof rotary lockable isolators	No.	4	
		l) 20A TP +N and earth isolators	No.	4	
		m) Photo cell wall mounted	No.	4	
5.5.2		PLUG & LIGHT POINTS etc			
		(Flush & surface including conduits, bends, boxes, wiring, cabling etc. complete)			
		Isolate, safely disconnect, remove and transport the following existing damaged electrics to UGU Stores			
		a) Light fittings (all types)	No	40	
		b) Power & plug points, isolators and other power points (all)	No	40	
		c) Level sensors, floats, flow meters, flow switches and other instruments	No	32	
		d) Conduits, wiring etc complete	m	160	
		e) All cables (per pump station - contractor to ascertain)	Sum	4	
TOTAL CARRIED FORWARD					

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
5.6		SECTION: HVAC INSTALLATION Air-conditioning and Ventilation/Extractor Fans: Supply and install the following: a) 12000 BTU/h Samsung or similar approved air-cooled mid-wall split air-conditioning unit complete b) 18000 BTU/h Samsung or similar approved air-cooled mid-wall split air-conditioning unit complete to office in Administration/Chemical Building c) Refrigerate piping and control cabling for the air-conditioning units supplied above including PVC trunking d) Condensate drain piping for the air-conditioning units supplied above e) Luft or similar and equal approved extract fans type Luft LPA 500/43F 380Volt 2m³/s with WC500 wall cowl cladding f) Create opening in brickwork and side cladding , patch up, waterproof and make good g) Connect all the air-conditioner units and fans to their respective electrical isolators or power points h) Test and commission the all air-conditioner units and ventilation fans supplied above i) Issue the compliance certificate for all the air-conditioner and fan electrical installation supplied above j) Provide the O & M manuals and handover data pack for all the HVAC systems supplied above	No.	1		
			No.	1		
			Sum	2		
			Sum	2		
			No.	1		
			No.	1		
			No.	3		
			Sum	1		
			Sum	1		
			Sum	1		
5.7		FIRE PROTECTION INSTALLATION Supply and install the following Fire Protection Equipment: a) 9 kg DCP fire extinguisher b) 5 kg CO2 fire extinguisher c) Photo luminescent and standard FE signs d) Warning - machine starts automatically signage e) Warning - electricity danger and no entry signage f) Number plate type signage and labels for large pumps g) Lump sum labelling for all other equipment etc complete h) All other standard and statutory signage ,labels and notices deemed necessary	No.	4		
			No.	1		
			No.	4		
			No	4		
			No	4		
			No	10		
			Sum	1		
			Sum	1		
5.8		SECTION: ELECTRICAL AND INSTRUMENTATION GENERAL ITEMS OTHER a) All other equipment and materials not measured elsewhere but necessary for complete a working installation (specify seperately) b) Labelling of all switches, switchgear and equipment as specified for all 4 pump stations.	Sum	1		
			Sum	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
5.9		TESTING AND COMMISSIONING				
5.9.1		Test and commission the complete Electrical & Instrumentation installation as specified for all 4 pump stations comprising the following:	Sum	4		
		a) Develop Site Acceptance Test (SAT) Schedule b) Draft submission to Engineer c) Revisions as required d) Contractor's testing (labour and special test requirements) e) Conduct FAT under Engineer's Supervision f) Conduct SATs under Engineer's Supervision g) Issue Final Certificate of Compliance (COC)				
5.10.		DOCUMENTATION				
		a) Submit As-built Electrical & Instrumentation drawings to the Engineers satisfaction where not measured elsewhere, comprising the following for all 4 pump stations :	Sum	4		
		1 x full set "red line" drawings (hard copy)				
		4 x sets manufacturers and supplier schedules and drawings (hard copy + CD)				
		b) Submit M E & I Operation & Maintenance Manuals to the Engineers satisfaction, comprising the following for all 4 pump stations :	Sum	4		
		4 x sets manufacturers and supplier schedules, operation and maintenance manuals and drawings (hard copy + electronic CD)				
5.11.		TRAINING				
5.11.1		Provide training to UGU personnel on systems not measured elsewhere for entire M E & I Installation as follows for all 4 pump stations :	Sum	4		
		a) Skills Transfer : Allow for training of 4 x UGU operations and maintenance members.				
		b) Training : Allow for Maintenance team 3 days for 4 people and Operations team 2 days for 4 people.				
5.11.2		Provide Training Manuals for entire M E & I Installation not measured elsewhere for critical operation and maintenance of the complete system for all 4 pump stations	Sum	4		
5.11.3		Test and issue the electrical certificate of compliance (COC) for the entire project. Separate COC's required for each building, structure or installation for all 4 pump stations	Sum	4		
5.1		GENERAL				
		Provisional sum for other works as follows : (under Engineer Instruction only)	Prov Sum	1	150 000.00	150 000.00
		a) Site acceptance tests (SAT's) by Specialist, Client and Engineering team				
		b) Factory acceptance tests (FAT's) by Contractor, Client and Engineering team				
		c) Profit and attendance for item above	%	150000		
TOTAL CARRIED FORWARD						

C.51

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 5 : PUMPSTATIONS ELECTRICAL AND INSTRUMENTATION

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
		d) Guarantee and full maintenance of the entire M E & I Installation system for 12 months after handover to the client, comprising the following for all 4 pump stations : i) Full list of material and maintenance plan to be provided ii) Material and Labour cost included Any other item the tenderer considers has been omitted and which requires pricing as separate items. i) ii)	Sum	1		
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 6 : E&M STANDBY GENERATORS AND TRANSFORMERS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
6		SECTION 6 : E&M STANDBY GENERATORS AND TRANSFORMERS				
6.1		STAND-BY GENERATORS & TRANSFORMER				
6.1.1.1		Allow a provisional sum of R 500 000,00 for the refurbishment and repairs of the existing 2 x diesel generators for the Margate Pump Station - 3A and Margate Pump Station - 4A (note : condition and type of generators to be assessed and a report provided)	Sum	1		
6.1.1.2		Allow an amount to disconnect, remove, transport , install in position and reconnect the existing generator in the new generator room for Pump Station 4A	Sum	1	75 000.00	75 000.00
6.1.1.3		Allow a % for mark-up and attendance on above (6.1.1.1 & 6.1.1.2 provisional sum items	%	75000		
6.1.2		Design, supply , deliver to site and offload the following silent type canopy stand-by diesel generators with fuel tank, change over panel and change-over contactors complete as specified :				
		a) 80kVA for Margate Pump Station - 1 (1 x 22kW duty and 1 stand-by pump)	Sum	1		
		a)100kVA for Margate Pump Station - 1A (1 x 22kW duty and 1 duty assist pump)	Sum	1		
		c) 650kVA for Margate WWTW (for all pumps , aerators, clarifiers , blowers , etc)	Sum	1		
		d) Offload and rig into positions and connect the above 3 off new generators	Sum	3		
		e) Isolate , disconnect , remove and transport the existing 500kVA 400 Volt transformer at the WWTW site to the UGU Stores	Sum	1		Rate Only
		f) Design , manufacture and supply the 630kVA 11kV/0,4kV transformer as specified for the WWTW power upgrade	Sum	1		Rate Only
		g) Deliver to the site the transformer supplied above	Sum	1		Rate Only
		h) Off-load and rig into position the above transformer and connect up	Sum	1		Rate Only
		i) Provide 3000 liters of diesel for testing and commissioning of the 5 off generators	litre	3000		
		j) Allow for the earthing mat and earthing for the 5 off	Sum	5		
		k) Connect up, test and commission the above 5 off generators including synchronising with the main supply	Sum	4		
		l) Connect up, test and commission the above new transformer	Sum	1		
6.2		CABLES				
6.2.1		Supply Cables PVC/SWA/PVC/ECC cables per SANS 1507				
		(a) 1,5mm ² x 14 core ECC	m	80		
		(b) 6mm ² x 4 core ECC	m	80		
		(c) 1,5mm ² x 7 core ECC	m	1		
		(d) 1,5mm ² x 4 core ECC	m	1		
		(e) 35mm ² x 4 core ECC	m	1		
		(f) 95mm ² x 4 core ECC	m	1		
		(g) 150mm ² x 4 core ECC	m	40		Rate only
TOTAL CARRIED FORWARD						

SECTION 6 : E&M STANDBY GENERATORS AND TRANSFORMERS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
6.2.2		Installation of above supplied PVC/SWA/PVC/ECC cables per SANS 1507 in ducts , sleeves, cable tray etc (a) 1,5mm² x 14 core ECC (b) 6mm² x 4 core ECC (c) 1,5mm² x 7 core ECC (d) 1,5mm² x 4 core ECC (e) 35mm² x 4 core ECC (f) 95mm² x 4 core ECC (g) 150mm² x 4 core ECC	m m m m m m m	80 80 20 20 20 40 40		
6.2.3		Cable Glands : Rates shall include the termination of cables in distribution boards, MCCs , kiosks etc and equipment per supplier recommended termination detail. To include corrosion proof CCG Corrugard glands, shrouds, lugs and cable numbers. (a) 1,5mm² x 14 core ECC (b) 6mm² x 4 core ECC (c) 1,5mm² x 7 core ECC (d) 1,5mm² x 4 core ECC (e) 35mm² x 4 core ECC (f) 95mm² x 4 core ECC (g) 150mm² x 4 core ECC	No No No No No No No	8 8 8 8 4 4 8		
6.2.4		Trenching etc.				
	SANS1200 DB, PSDB	a) Trenching 400 wide x 800 deep in pickable to hard ground b) Backfilling of above trenches	m m	80 80		
6.2.4.1		Sleeves and accessories (supply and install) (a) Supply and install cable danger warning tape (b) Concrete cable markers (c) 150Ø uPVC cable sleeves d) 350W heavy duty cable ladder	m No. m m	80 8 20 20		
6.2.5		Allow an amount for a generator specialist to set up and test the new generator and controls with the mains power supply for all 5 sets	Sum	1		
6.2.6		Allow an amount for a generator specialist to synchronize the four generators with the mains supply	Sum	1		
6.2.7		Allow a sum for the O & M manuals for the 5 x generators and step-up transformer .	Sum	1		
6.2.8		Allow for training of operational and maintenance staff on the operations and maintenance of the 5 x generators and transformer system supplied above complete	Sum	1		
6.2.9		Allow a provisional sum of R 40 000,00 for any unforeseen work to be used entiely at the discretion of the Client or Engineer and for the Engineer to attend the FAT	Sum	1	40 000.00	40 000.00
6.2.10		Allow for profit and attendance on the above provisional sum	%	40000		
6.2.11		Allow for all notices , safety signage etc complete for the 5 x generators and transformer	Sum	1		
6.2.12		Any other item the tenderer considers has been omitted and which requires pricing as separate items. i) ii)				
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 7 : ELECTRICAL SITE LIGHTING, GENERAL & PROV SUMS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
7		SECTION 7 : ELECTRICAL SITE LIGHTING, GENERAL & PROV SUMS				
7.1		STREETLIGHTING				
7.1.1		Supply light fittings / luminaries and poles as specified with lamps (refer to project specification for details) All lights by TLF Lighting				
		a) Type E - 100W LED Solar powered streetlights with photocell by TLF/Beka with mounting pole brackets	No.	25		
		b) Type F - 9,5m galvanised poles	No.	15		
		c) Type G - 9,5m galvanised poles with back to back bracket	No.	5		
		d) Type H - 60W LED 230V streetlight by TLF/Beka	No.	4		
7.1.2		Install and connect the light fittings and poles supplied above.				
		a) Type E - 100W LED Solar powered streetlights with photocell by TLF/Beka with mounting pole brackets	No.	25		
		b) Type F - 9,5m galvanised poles	No.	15		
		c) Type G - 9,5m galvanised poles with back to back bracket	No.	5		
		d) Type H - 60W LED 230V streetlight by TLF/Beka	No.	4		
7.2		HIGH MAST LIGHTING				
		a) Allow a provisional sum for upgrade of the existing high mast or site lighting	Prov Sum	1	65 000.00	65 000.00
		b) Allow a % for mark-up and attendance on above provisional sum item	%	65000		
7.3		OTHER				
		Allow a provisional sum of R 350 000.00 to conduct an audit on the existing lightning protection and earthing system on all existing structures on the plant and provide a report. To include to install new systems to bring the lightning protection and earthing systems up to compliance	Prov Sum	1	350 000.00	350 000.00
7.3.1						
7.3.2		Allow percentage mark-up and attendance on above	%	350000		
7.3.3		Supply and install 20Amp TP CB in MCCs for supply to streetlights and connect to busbars etc	No	4		
7.3.4		Supply and install CCG or similar weatherproof junction boxes with terminals	No	20		
7.3.5		Test and commission the entire streetlights system and submit the electrical certificate of compliance	Sum	1		
7.3.6		Provide O & M manuals for the streetlights and electrical installation .	Sum	1		
7.3.7		Provide for all notices , safety signage etc complete	Sum	1		
7.3.8		Any other item the tenderer considers has been omitted and which requires pricing as separate items. i) ii)				
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 8 : PUMP STATIONS MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
8		SECTION 8 : PUMP STATIONS MECHANICAL WORKS				
		PUMPSTATIONS (MARGATE 1 , MARGATE 1 A , MARGATE 3A & MARGATE 4A)				
		Note : All pump pipework, valves, fittings and associated equipment are measured elsewhere				
		Design , supply , manufacture , deliver , offload , install , connect up, test and commission, guarantee and maintaing the pumping plant and associated equipment to UGU DM standards and to the relevant SANS, BS or other recognised codes and standards				
		Make safe, disconnect, remove, lift or load , transport and deliver the existing pump sets, motors and associated equipment to UGU Stores and offload as follows :				
8.1		a) Sewage pumps at Margate Pump Station 1	No	2		
8.1.1		b) Sewer pumps at Margate Pump Station 1A	No	2		
8.1.2		c) Sewer pumps at Margate Pump Station 3A	No	3		
8.1.3		d) Sewer pumps at Margate Pump Station 4A	No	3		
8.2		Design, manufacture , supply and deliver the following new sewer pump sets (to replace existing) :				
8.3		a) Margate Pump Station 1 - Sewage pump immersible type with motor , all sensors , cabling etc complete (1 duty and 1 stand-by) - duty 19,36l/s @ 17m head as specified (1 pump to be supplied as spare and stored in UGU Stores)	No	3		
8.4		a) Margate Pump Station 1A - Sewage pump immersible type with motor, all sensors , cabling etc complete (1 duty and 1 duty assist) - duty 11,67l/s @ 32m head as specified	No	2		
8.5		a) Margate Pump Station 3A - Sewage pump immersible type with motor , all sensors , cabling etc complete (1 duty, 1 duty assist and 1 stand-by) - duty 108,67l/s @ 50,27m head as specified	No	3		
8.6		a) Margate Pump Station 3A - Sewage pump immersible type with motor , all sensors , cabling etc complete (1 duty, 1 duty assist and 1 stand-by) - duty 204,04l/s @ 42m head as specified	No	3		
8.7		Install, connect up and alignment of the new pump sets supplied above as follows :				
8.7.1		a) Sewage pumps at Margate Pump Station 1	No	2		
8.7.2		b) Sewer pumps at Margate Pump Station 1A	No	2		
8.7.3		c) Sewer pumps at Margate Pump Station 3A	No	3		
8.7.4		d) Sewer pumps at Margate Pump Station 4A	No	3		
8.8		Manufacture, supply and deliver the immersible type sewage sump pumps in each of the dry wells for each of the above pump stations. To include all fittings , 10m cabling, NRV, float switches for auto start and stop and 10m of flexible hose to pump into wet well. Pump to be installed in 500x500x500 deep sump - Duty of pump : 5l/s at 10 m head (TBC)	Sum	2		
8.9		Install and connect up the sump pumps supplied above	Sum	4		
8.10		Supply, install and connect up the following ancilliary equipment :				
8.11		a) Wika or similar pressure gauges 0 - 500kPA complete with piping, backing board etc	No	7		
8.12		b) Wika or similar pressure gauges 0 - 1000kPA complete with piping, backing board etc	No	3		
8.13		c) ½" BSP sockets with stop-cocks welded on steel pipework	No	10		
TOTAL CARRIED FORWARD						

SECTION 8 : PUMP STATIONS MECHANICAL WORKS

ITEM	REF	DESCRIPTION
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BALANCE BROUGHT FORWARD					
8.14	SAT - Test and commission the following pump sets supplied above :				
8.14.1	a) Sewage pumps at Margate Pump Station 1	Sum	2		
8.14.2	b) Sewer pumps at Margate Pump Station 1A	Sum	2		
8.14.3	c) Sewer pumps at Margate Pump Station 3A	Sum	3		
8.14.4	d) Sewer pumps at Margate Pump Station 4A	Sum	3		
8.15	Assist with testing of the pumping systems and rising mains for the following :				
8.15.1	a) Margate Pump Station 1 rising mains and electrics & controls	Sum	1		
8.15.2	a) Margate Pump Station 1A rising mains and electrics & controls	Sum	1		
8.15.3	a) Margate Pump Station 3A rising mains and electrics & controls	Sum	1		
8.15.4	a) Margate Pump Station 4A rising mains and electrics & controls	Sum	1		
8.16	Test and commission the sump pumps supplied above in each of the above pump stations	Sum	4		
8.17	Design and submit technical specifications and detailed dimensioned drawings for all the pump sets supplied above	Sum	1		
8.18	Design and submit layout drawings of the pump sets and pipework & valve details and layout drawings for each of the pump stations as follows :				
8.18.1	a) Margate Pump Station 1	Sum	1		
8.18.2	b) Margate Pump Station 1A	Sum	1		
8.18.3	c) Margate Pump Station 3A	Sum	1		
8.18.4	d) Margate Pump Station 4A	Sum	1		
8.19	Supply, deliver, off-load and install the dewatering pump including motor and all fittings complete for pump station 3A & 4A as specified as follows : a) Diesel motor driven dewatering pump with all fittings, couplings etc complete for a duty as specified to match the existing Selwood S150 with HA494 45kW engine for Pump Stations 3A & 4A (refer to the project specification for more details)	No	2		
8.20	Prepare and submit test and commissioning data sheets for all the above pump stations	Sum	1		
8.21	Submit the O & M manuals for all the above pump stations as specified	Sum	1		
8.22	Allow an amount for the FAT for the pumps for the Engineer and Client to attend for witness tests at the manufacturer's premises as follows (to include all costs, flights, car hire, accommodation etc) :		1		
8.22.1	a) Margate 1 pumps	Sum	1		
8.22.2	b) Margate 1A pumps	Sum	1		
8.22.3	c) Margate 3A pumps	Sum	1		
8.22.4	d) Margate 4A pumps	Sum	1		
8.24	Supply and install a 2 ton electric hoist complete with motor, hooks, electrics, controls, pendant with travel trolley hooked on existing I-Beam etc complete (for lifting of pumps) in Pump Station 4A	Sum	1		
8.25	Provide training for the UGU Plant operations and maintenance staff for the entire pumping system for all the 4 pump stations and WTW	Sum	1		
8.26	Provide all labels and signs for all pumps and all pump stations	Sum	1		
TOTAL CARRIED TO SUMMARY					

C.57

**REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
CONTRACT No: UGU-07-1683-2024**

SECTION 8 : PUMP STATIONS MECHANICAL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
8.27		Allow a provisional sum of R 100 000,00 for any unforeseen work the amounts of which are to be used entirely at the discretion of the Engineer and Client	Prov Sum	1	100 000.00	100 000.00
8.28		Allow for profit and attendance on provisional sum above	%	100000		
8.29		Provide the O & M manuals in comprehensive format as specified for all the pump stations (5 hard and 5 soft copies)	Sum	1		
8.30		Any other items the tenderer considers has been omitted and which requires separate pricing as follows : a) b)				
TOTAL CARRIED TO SUMMARY						

[illegible]

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
	8.3.2	Extra Over Items 2.2.1-2.2.9 for Excavations above:				
9.2.11	8.3.2 (b)	Intermediate excavation (provisional)	m³	2323		
9.1.12	8.3.2 (b)	Hard rock excavation (Chemical Blasting) (provisional)	m³	2751		
9.1.13	8.3.2 (b)	Boulder Class A excavation (provisional)	m³	1375		
9.2.14	8.3.2 (b)	Boulder Class B excavation (provisional)	m³	344		
9.2.15.1	8.3.2	Hand excavation and backfill where ordered by the Engineer	m³	290		
		Make up deficiency in backfill material				
9.2.15.2	8.3.3.1(a)	a) From other necessary excavations on site	m³	670		
9.2.15.3	8.3.3.1(c)	b) By importation from commercial or off-site sources selected by the Contractor	m³	4092		
9.2.16	8.3.2	Extra Over Items 2.2.1-2.2.9 for Excavations above: Soilcrete backfill where directed by the Engineer	m³	600		
	8.3.2	Extra-over to Items 2.2.1-2.2.9 Excavations for restricted working width:				
		Working width from 0 m up to 2 m:				
9.2.17		(a) Exceeding 0,0m but not exceeding 2,0 m.	m	384		
9.2.18		(b) Exceeding 2,0m but not exceeding 3,0 m.	m	1012		
9.2.19		(c) Exceeding 3,0m but not exceeding 4,0 m.	m	72		
	8.3.5	Shoring by supporting both sides of the excavation for trenches and at chambers with restricted access for support height of:				
9.2.20		(a) Exceeding 0,0m but not exceeding 2,0 m.	m	384		
9.2.21		(b) Exceeding 2,0m but not exceeding 3,0 m.	m	1012		
9.2.22		(c) Exceeding 3,0m but not exceeding 4,0 m.	m	72		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
		EXISTING SERVICES				
	8.3.5	Existing services that intersect a trench:				
9.2.23		Telkom and Neotel fibre-optic cable	No.	10		
9.2.24		Overhead electric cables	No.	10		
9.2.25		Underground electrical cables	No.	10		
9.2.26		Watermains of pipe diameters up to DN 500 mm	No.	10		
9.2.27		Fences	No.	50		
9.2.28		Stormwater pipes up to DN 600	No.	10		
9.2.29		Stormwater channel crossings	No.	10		
9.2.30		Surface Road	No.	5		
	8.3.5	Existing services that adjoin a trench:				
9.2.31		Telkom and Neotel fibre-optic cable	m	50		
9.2.32		Overhead electric cables	m	600		
9.2.33		Underground electrical cables	m	600		
9.2.34		Watermains of pipe diameters up to DN 500 mm	m	600		
9.2.35		Fences	m	500		
9.2.36		Stormwater pipes up to DN 600	m	500		
9.2.37		Stormwater channel	m	500		
9.2.38	PSDB 8.3.4(b)	Allowance for dewatering and inflow water control with in trenching	Prov Sum	1	500 000.00	500 000.00
		Contractor's markup on item 1.2.2.37		500 000.00		
9.2.39	8.3.6	FINISHINGS				
9.2.39.1	8.3.6.1	Reinstate road surfaces				
9.2.39.2		a) Complete with all courses except surfacing	m²	720		
9.2.39.3		b) Asphalt 30mm thick on roadway	m²	720		
9.2.39.4	8.3.7	Accommodation of traffic	Sum	1		
TOTAL CARRIED FORWARD						

C.61

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 9 : EFFLUENT MAIN

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
9.3	8.3.3	EXCAVATION ANCILLARIES				
	8.3.3.1	Make up deficiency in backfill material.				
9.3.1	8.3.3.1	a) From other necessary excavations on site. (provisional)	m³	44		
9.3.2	8.3.3.1	b) By importation from designated borrow pits. (provisional)	m³	3974		
9.3.3	8.3.3.1	c) By importation from commercial or off-site sources selected by the Contractor. (provisional)	m³	252		
9.4		EROSION CONTROL BERMS				
		a) Erosion control berms 1.5m wide x 0.6m high where instructed by the Engineer including shaping and compaction to 90% MOD AASHTO density (LI)				
9.4.1	PSD.3.1		m	360		
9.5	PSDK	GABIONS AND PITCHING				
		GABIONS				
9.5.1	PSDK.1.1	1m x 1m x 2m gabions (LI) (provisional)	m³	217		
9.5.2		3m x 1m x 0.3m reno mattress (LI)	m³	79		
9.5.3	8.2.3	Extra-over Item 2.6.1 for packing selected stone to exposed face. (LI) (Where instructed by the Engineer)	m²	163		
9.5.5	PSDK.1.2	Geotextile (Grade A2)	m²	528		
9.6	8.2.5	PITCHING				
9.6.1		a) Ungrouted stone pitching to upstream face of erosion control berms. (LI)	m²	240		
9.6.2		b) Rock bolsters to details shown on the drawings (LI)	m	120		
9.7		BEDDING FROM TRENCH EXCAVATION				
	8.2.2	Bedding from trench excavations				
9.7.1		a) Selected granular material	m³	146		
9.7.2		b) Selected fill material	m³	52		
9.8		BEDDING FROM BORROW PITS				
		Provision of bedding from designated borrow pits (unlimited freehaul) and place in stockpile at 100m intervals along trench (Provisional items).				
9.8.1	8.2.2.3	a) Selected granular material	m³	525		
9.8.2		b) Selected fill material	m³	152		
9.9		BEDDING FROM COMMERCIAL SOURCES				
		Provision of bedding from commercial sources (unlimited freehaul) and place in stockpile at 100m intervals along trench (Provisional items).				
9.9.1	8.2.2.3	a) Selected granular material	m³	1099		
9.9.2		b) Selected fill material	m³	393		
9.9.3		c) 13.2mm stone	m³	200		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 9 : EFFLUENT MAIN

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
B	SABS 1200 L	SECTION B : MEDIUM PRESSURE PIPELINES (RETICULATION)				
9.10.		PIPEWORK				
	8.2.1	Lay, bed (Class B as per drawing LB1-1(b) of SABS 1200 LB), weld, test and disinfect complete the following:				
9.10.1		i) 450mm OD API Grade x42 cement mortar lined 3LPE coated x 6mm thick steel pipes (PN40)	m	500		
9.10.2		ii) 600mm OD API Grade x42 cement mortar lined 3LPE coated x 6mm thick steel pipes (PN40)	m	2500		
9.10.3		i) 450mm diameter oPVC Class 34	m	1		Rate Only
9.10.4		ii) 630mm diameter oPVC Class 34	m	1		Rate Only
9.10.1		i) 450mm diameter oPVC Class 34	m	2000		
9.10.2		i) 630mm diameter oPVC Class 34	m	400		
9.11		SPECIALS AND FITTINGS				
	8.2.2	Extra-over item 3.1.1 for laying and bedding of the following specials complete with couplings, gaskets, grade 8.8 nuts and bolts where required.				
		STEEL GROOVED BENDS				
9.3.2.1		i) 600mm PN40 Flanged Steel 90° bend	No	4		
9.3.2.2		ii) 600mm PN40 Flanged Steel 45° bend	No	4		
9.3.2.3		iii) 600mm PN40 Flanged Steel 22.5° bend	No	5		
9.3.2.4		iv) 600mm PN40 Flanged Steel 11.25° bend	No	10		
9.3.2.5		v) 450mm PN40 Flanged Steel 45° bend	No	4		
9.3.2.6		vi) 450mm PN40 Flanged Steel 22.5° bend	No	4		
9.3.2.7		vii) 450mm PN40 Flanged Steel 11.25° bend	No	5		
		oPVC BENDS				
9.3.2.1		i) 450mm Ø 90° bend, class 34	No	1		Rate Only
9.3.2.2		ii) 450mm Ø 45° bend, class 34	No	1		Rate Only
9.3.2.3		iii) 450mm Ø 22.5° bend, class 34	No	1		Rate Only
9.3.2.4		vi) 450mm Ø 11.25° bend, class 34	No	1		Rate Only
9.3.2.5		i) 630mm Ø 90° bend, class 34	No	1		Rate Only
9.3.2.6		ii) 630mm Ø 45° bend, class 34	No	1		Rate Only
9.3.2.7		iii) 630mm Ø 22.5° bend, class 34	No	1		Rate Only
	8.2.2	Supply, lay and bed of the following specials complete with couplings, gaskets, SS 304 nuts and grade 8.8 bolts where required.				
9.3.3		STEEL REDUCERS				
9.3.3.1		i) 600mm to 450mm NB flanged reducers	No	2		
9.3.3		TEES				
9.3.3.1		i) 600mm diameter cast iron equal tee PN40	No	2		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
9.3.4		FLANGE ADAPTORS				
9.3.4.1		i) 600mm Ø cast iron flange adaptor PN40	No	2		
9.3.4.2		ii) 450mm Ø cast iron flange adaptor PN40	No	2		
9.3.4.3		Allowance for fitting for the connection to existing services.	Sum	1		
9.3.4	PSL.3.4	CORROSION PROTECTION				
	8.2.15	Denso wrapping in corrosive soil inclusive of outer wrap layer.				
		External Denso" wrap of pipes and fittings including mastic where applicable and overwrap etc. applied in accordance with manufacturer's instruction."				
9.3.4.1		FLANGE ADAPTORS				
9.3.4.1.1		i) 650mm Ø cast iron flange adaptor PN40	No	2		
9.3.4.1.2		ii) 450mm Ø cast iron flange adaptor PN40	No	2		
9.3.4.2		TEES				
9.3.4.2.1		i) 600mm diameter cast iron equal tee PN40	No	2		
9.14	SABS 1200 GA	CONCRETE (SMALL WORKS)				
	8.2.11	Anchor / Thrust Blocks and Pedestals				
		Supply all materials, labour, plant and construct 15MPa concrete anchor/thrust blocks and pedestals as detailed on the drawings including all trimming and formwork required. the concrete shall be mixed on site by labour intensive methods (LI)				
9.14.1			m³	46		
9.15	8.6	PIPE ROUTE MARKERS				
		Supply and install precast concrete pipe route markers every 100m along pipe route and at every intersection and change of direction. Valve markers are to be painted yellow with two coats road marking paint and should include the letters 'W'. The rate shall include for all costs to excavate, backfill and place markers. All work, including the manufacture of the markers, is to take place on site using labour intensive methods (LI)				
9.15.1			No	48		
9.15.2		Allowance to connect onto existing infrastructure	Sum	1		
9.16	SABS 1200 L	SECTION C : AIR VALVES				
		FITTINGS				
		a) 50mm Diameter AV for 600/450mm diameter Steel pipe				
	8.2.5	Supply & Lay pipes, valves and specials as per relevant drawing				
9.16.1	PSL.4.5	i) 50mm diameter Vent-O-Mat" (or similar approved) Air Valve (50-RB-X-40-1-1)"	No	9		
9.16.2		vii) 50mm Ball Valve, Class 16	No	9		
9.16.3		iii) 50mm diameter GMS pipe, 600mm long (Confirm length on site) - threaded one end and flanged on the other end (Item 3)	No	9		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
9.16.4		iv) 50mm diameter GMS pipe 310mm long (Confirm length on site) - flanged both ends (Item 4)	No	9		
9.16.5		50m Blank flange screw threaded	No	9		
9.16.6		v) 450mm VJ flange adaptor, Class 16	No	9		
9.16.7		vi) 450 x 50mm diameter GMS tee FAE to SABS 664 FBE to SABS 1123 - 1600/3	No	9		
9.16.8		AIR VALVE CHAMBERS				
	8.2.13	Valve and Hydrant Chambers, etc				
		Supply all labour, plant and materials and construct valve chamber complete including walls, reinforced slabs, GMS cover and Ladders, etc as detailed on the drawings but excluding locks measured elsewhere.	No	9		
9.16.8.1						
9.16.8.2		Supply and installation of Smartlock HD700 Lid and frame with mechanical friction lock	No	9		
9.16.9	PSL.3.4	CORROSION PROTECTION				
	8.2.15	Denso wrapping in corrosive soil inclusive of outer wrap layer.				
		External Denso" wrap of pipes and fittings including mastic where applicable and overwrap etc. applied in accordance with manufacturer's instruction."				
		TEES				
9.16.9.1		i) 450mm GMS unequal tee, flanged all ends (item 5), class 16	No	9		
		GMS PIPES				
9.16.9.2		50mm diameter	No	9		
		FLANGE ADAPTORS				
9.16.9.3		450mm diameter, class 16	No	18		
	SABS 1200 GA	CONCRETE (SMALL WORKS)				
9.17	8.6	VALVE MARKERS				
		Supply and install precast concrete valve markers. Valve markers are to be painted yellow with two coats road marking paint and should include the letters 'AV'. The rate shall include for all costs to excavate, backfill and place markers. All work, including the manufacture of the markers, is to take place on site using labour intensive methods (LI)	No	9		
9.17.1						
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
9.18	SABS 1200 L	SECTION D : ISOLATING VALVES				
		FITTINGS				
		a) 450mm diameter Isolating Valve for 600/450 Steel pipe				
	8.2.5	Supply and Lay of pipes, valves and specials				
9.18.1		i) 450mm diameter AVK 06/30 PN16 Gate valve Flanged both ends	No	1		
9.18.2		ii) 450mm galvanised, VJ flanged adaptor, Class 16 (item 2)	No	2		
		iii) 450 x 1314mm puddle flange (puddle flange welded 500mm from one end) FBE to SABS 664 FBE to SABS 1123 - 1600/3 on both ends	No	2		
9.18.3		ISOLATING VALVE CHAMBERS				
	8.2.13	Valve and Hydrant Chambers, etc				
		Supply all labour, plant and materials and contract Isolating valve chamber complete including manhole rings, reinforced slabs, GMS cover and locking bar etc as detailed on the drawings but excluding locks measured elsewhere.	No	1		
9.18.3.1			No	1		
9.18.3.2		Supply and installation of Smartlock HD700 Lid and frame with mechanical friction lock	No	1		
	SABS 1200 GA	CONCRETE (SMALL WORKS)				
9.19		VALVE MARKERS				
		Supply and install precast concrete vaive markers. Valve markers are to be painted yellow with two coats road marking paint and should include the lette 'IV". The rate shall include for all costs to excavate, backfill and place markers. All work, including the manufacture of the markers, is to take place on site using labour intensive methods (LI)	No	1		
9.19.1			No	1		
9.20.	PSL.3.4	CORROSION PROTECTION				
	8.2.15	Denso wrapping in corrosive soil inclusive of outer wrap layer.				
		External Denso" wrap of pipes and fittings including mastic where applicable and overwrap etc. applied in accordance with manufacturer's instruction."				
		FLANGE ADAPTORS				
9.20.1		450mm diameter	No	2		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
E	SABS 1200 L	SECTION E : SCOUR VALVES				
9.20.2		FITTINGS				
		a) 100mm Diameter SV for 600/450mm diameter Steel Pipe				
9.20.2.1		i) 100mm diameter Jet disperser	No	4		
9.20.2.2		ii) 100mm diameter GMS straight pipe flanged one end 1500mm (confirm length on site)	No	4		
9.20.2.3		iii) 100mm dia 45 degree GMS elbow flanged both ends (item 5)	No	4		
9.20.2.4		v) 100mm diameter AKV gate valve resilient seated fange, with pin indicator 06/35	No	4		
9.20.2.5		v) 450mm VJ flange adaptor, Class 16	No	8		
9.20.2.6		TEES				
9.20.2.7		450mm x 100 mm GMS tee FAE, class 16 flanged	No	4		
9.21		SCOUR VALVE CHAMBER				
	8.2.13	Valve and Hydrant Chambers, etc				
		Supply all labour, plant and materials and conctruct scour valve chamber complete including manhole cover slabs, GMS access cover etc as detailed on the drawings but excluding locks measued elsewhere				
9.21.1			No	4		
9.21.2		Supply and installation of Smartlock HD700 Lid and frame with mechanical friction lock	No	4		
9.23	PSL.3.4	CORROSION PROTECTION				
	8.2.15	Denso wrapping in corrosive soil inclusive of outer wrap layer.				
		External Denso" wrap of fittings including mastic and overwrap etc. applied in accordance with manufacturer's instruction."				
		ELBOWS				
9.23.1		100mm diameter	No	16		
		GMS PIPES				
9.23.2		100mm diameter	m	4		
		FLANGE ADAPTORS				
		450mm diameter	No	4		
9.23.3		VALVE MARKERS				
		Supply and install precast concrete valve markers. Valve markers are to be painted yellow with two coats road marking paint and should include the letter 'SV'. The rate shall include for all costs to excavate, backfill and place markers. All work, including the manufacture of the markers, is to take place on site using labour intensive methods (LI)				
9.23.3.1			No	4		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
F	SABS 1200 DB	SECTION F: ROAD CROSSINGS				
9.24	8.3.2	EXCAVATION				
		Excavate by machine in all materials for trenches, backfill, compact and dispose of surplus material, for pipe diameters up to 200mm in the following depth catagories :-				
	PSD1.1					
9.24.1		a) 1,0 - 2,0 m. (machine and including shoring)	m³	24		
9.25	SABS 1200 LB	BEDDING				
	8.2.2	Bedding from trench excavations				
9.25.1		a) Selected fill	m³	1		
	8.2.2.3	Provision of bedding from commercial sources.				
9.25.2		a) Selected granular material	m³	7		
9.26	8.3.6	FINISHING				
	8.3.6.1	Extra-over item 9.1.1 to reinstate road surfaces complete with all courses.				
9.26.1		a) 200mm layer G2 Gravel wearing course compacted to 95% MOD. AASHTO Density	m³	2		
9.26.2		b) 900mm layer selected G5 type material compacted to 93% MOD. AASHTO Density	m³	11		
9.26.3		c) 40mm Asphalt	m²	12		
9.27		ACCOMODATION OF TRAFFIC				
		All work to accomodate traffic including signage, safe barricading and the management thereof.				
9.27.1	PS.3.15		Sum	1		
9.28	SABS 1200 L	PIPEWORK				
	8.2.1	Supply, lay and bed pipes and specials complete with couplings - test and dis-infect				
9.28.1		ii) 450mm galv steel pipe FBE to SABS 664 FBE to SABS 1123 - 2500/3	m	6		
9.28.2		i) 450 mm Flange adaptor PPE, FOE to SABS 664 - SABS 1123 - 1600/3	No	2		
9.28.3		vi) 450mm diameter RSV Class 25 Gate valve with handwheel and anti clockwise closing to SABS 664 FBE to SABS 1123 - 1600/3	No	2		
9.28.4		iv) 550mm diameter heavy duty Class 34 Coreflow" pipe sleeve"	m	6		
9.29		MISCELLANEOUS				
9.29.1		110mm heavy duty Class 34 Coreflow" drain to scour"	m	5		
9.29.2		Headwall to 110mm diameter scour	No	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
9.29.3		Chambers complete with concrete base and all reinforcing, shuttering (including excavation) and with GMS manhole cover as detailed on the drawings but excluding locks measured elsewhere for total depth of chamber up to 2.0m	No	2		
9.29.4		i) 450mm galvanised steel pipe FBE to SABS 664 FBE to SABS 1123 - 2500/3 including cutting of pipe and joints sets. 12m length	No	2		
9.29.5		ii) 450 mm Flange adaptor PPE, FOE to SABS 664 - SABS 1123 - 1600/3	No	4		
9.29.6		ii) 600mm diameter heavy duty Class 34 Coreflow" pipe sleeve"	m	6		
9.30.		PIPE JACKING CROSSINGS (ALL PIPES EFFLUENT, RISING AND GRAVITY MAINS)				
9.30.1		a) Fixed Charges	Sum	15		
9.30.2		b) Time- related charges for jacking operations	Sum	15		
9.30.3		Supply of pipes to be jacked				
9.30.4		700Ø Steel pipe	m	135		
9.30.5		700Ø STUB and FLANGE	No	23		
9.30.6		200Ø Steel pipe	m	97		
9.30.7		200Ø STUB and FLANGE	No	16		
9.30.8		Butt welding	No	15		
9.30.9		Jacking of pipes into their final positions- vertical specified slope				
9.30.10		Drilling and installation of 700Ø sleeve in intermediate conditions	m	135		
9.30.11		Drilling and installation of 200Ø sleeve in intermediate conditions	m	97		
9.30.12		Excavation for jacking of Intermediate material	m³	70		
9.30.13		Excavation of hard rock (Blasting)	m³	162		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
G	SABS 1200 L	SECTION 9 : EFFLUENT MAIN				
		FITTINGS				
9.31	SABS 1200 L	PIPEWORK				
	8.2.1	Supply, lay and bed pipes and specials complete with couplings - test and dis-infect				
9.31.1		ii) 450 x 6000mm pipe FBE to SABS 664 FBE to SABS 1123 - 1600/3	No	7		
9.31.2		i) 450 mm Flange adaptor PPE, FOE to SABS 664 - SABS 1123 - 1600/3	No	3		
9.31.3		ii) 450mm 45° steel pipe flanged to SABS 1123 - 1600/3	No	2		
9.31.4		ii) 450mm steel pipe FBE length 1m to SABS 1123 - 1600/3	m	2		
9.32		Pipe Support Structure for Existing infrastructure				
9.32.1		100/100/8 equal angle members	m	32		
9.32.2		M16 bolts and nuts	No	160		
9.32.3		M16 Anchor stud resin stud, 190mm stud length	No	160		
9.32.4		500mm x 1200 x 6mm galvanized steel plate	No	4		
9.32.5		450mm M16 steel clamps, with one end using resin studs and the other end to be threaded	No	8		
9.33		CONCRETE SUPPORT COLUMN				
9.33.1		EARTHWORKS				
9.33.2		Excavation of Intermediate material for foundation	m³	1		
9.33.3		Imported G5 earth filling compacted to 95 Mod AASHTO	m³	2		
9.33.4		CONCRETE, FORMWORK AND REINFORCEMENT				
		Formwork: Formwork to sides of bases, pile caps, ground beams, etc will only be measured where it is prescribed by the engineer for design reasons. Formwork necessitated by irregularity or collapse of excavated faces will not be measured and the cost thereof shall be deemed to be included in the allowance for taking the risk of collapse of the sides of the excavations, provision for which is made in "Earthworks"				
9.33.5		REINFORCED CONCRETE				
9.33.5.1		15MPa/19mm concrete Blinding in bases	m³	1		
9.33.5.2		30MPa/19mm concrete in foundation base	m³	1		
9.33.5.3		30MPa/19mm concrete in columns	m³	2		
9.34		TEST BLOCKS				
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
9.34.1		Allow for all necessary concrete test cubes size 150 x 150 x 150mm, cast from batches of concrete required for the entire contract as specified, made, stored, cured and tested in accordance with SABS Methods 861 and 863, including use of approved cube moulds, transporting to an approved testing laboratory for testing, paying all charges and submitting reports to the Engineer	Item	2		
9.35		CONCRETE SUNDRIES				
		Finishing top surfaces of concrete smooth with a steel trowel - Class U3 steel trowel finish				
9.35.1		Surface of column	m²	24		
9.36		SMOOTH FORMWORK				
		Smooth formwork to sides				
9.36.1		Sides of Column	m²	24		
9.37		REINFORCEMENT				
		High tensile steel reinforcement to structural concrete work				
9.37.1		Y 10 BARS	t	0.2		
9.37.2		Y 12 BARS	t	0.2		
TOTAL CARRIED FORWARD TO SUMMARY						

[illegible]

SECTION 10 : MARGATE PUMPSTATION 1 CIVIL WORKS

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
10.3		TOPSOIL AND GRASSING				
10.3.1	8.3.10	Topsoil embankments and around pump station (150 mm thick) from stockpile provided under item 10.10.1.1	m²	50		
10.3.2	8.3.11	Grassing with runners 300mm apart	m²	100		
10.4	SABS	CONCRETE				
10.4.1	1200 G 8.2	Formwork				
10.4.2	8.2.2	Smooth formwork to walls supporting pipes	m²	5		
10.4.3	8.2.2	Smooth formwork for columns	m²	10		
10.4.4	8.2.2	Horizontal to underside of roof slab and base slab	m²	90		
10.4.5	8.2.5	Narrow widths to sides of plinths and walls	m	20		
10.4.6	8.3	Reinforcement				
10.4.7	8.3.2	High tensile welded mesh ref 193 reinforcement	m²	110		
10.4.8	8.3.1	High tensile steel reinforcement of all diameters between 10mm and 25mm	t	3		
10.4.9	8.4	Concrete				
10.4.10	8.4.2	50mm to 100 mm Blinding Layer Class 10/12 Concrete	m²	10		
10.4.11	8.4.3	Grade 20/19 concrete to thrust blocks, pumphouse footings, aprons and walls as ordered by the Engineer	m3	7		
10.4.12	8.4.3	Grade 30/19 concrete in floor slabs, roof slabs and plinths	m3	27		
10.4.13	8.4.3	Grade 30/19 concrete to channel	m3	5		
10.4.14	8.4.4	Unformed surface finishes				
10.4.15	8.4.4 b)	Steel float finish to concrete pump bases.	m2	12		
10.4.16	8.4.4 b)	Steel float finish to concrete channel.	m	10		
10.4.17	8.4.4 c)	Power float finish to pump house floor slab and roof slab	m²	125		
10.4.18	8.4.4 b)	Steel float to wall narrow widths	m	5		
10.4.19	8.4.4 a)	Wood float to concrete apron	m²	70		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
10.8	PB 12	METALWORK D.V. steel door frame and double transformer steel door, 2040W x 3065 H fully louvred Type M, complete with suitable 3 lever lockset built into walls with galvanised vermin proof mesh on the inside (as shown on drawings)	No	1		
10.8.1						
10.8.2		Extra over 3.10.2 for purpose made opening 300 x to permit removal of pumps by use of gantry, including locking device as shown on the drawings	No	1		
10.8.3		Windows				
10.8.4		Supply and build in Industrial windows type BLU, 1590 x 745 mm with pressed steel louvres and galvanised vermin proof mesh on the inside	No	11		
10.9		CRAWL BEAM AND HOIST				
10.9.1	PL.01	Supply and delivery of Monorail (I Beam) Crawler	No	1		
	PL.02	Installation, testing and commissioning of Monorail (I Beam) crawler	No	1		
10.9.2	PL.03	Supply and delivery of slewing jib Crane with a maximum load capacity of 1000kg, maximum reach of 4.0 m and Height of 4.0 m, pillar mounted And slew range of 300°	No	1		
10.9.3						
10.9.4	PL.04	Installation, testing and commissioning of slewing jib crane	No	1		
10.10		EPOXY MORTAR ON FLOORS				
10.10.1	PEF - 4.19	Surface preparation, screeding and curing of floors	m2	53		
B		GENERAL SITE WORK				
10.1	SABS 1200C	SITE CLEARANCE				
10.1.1	8.2.1	Clear and grub 3.0 width along centre line of pipeline route (Provisional)	m	135		
10.2	SABS 1200 DB	EARTHWORKS (Pipe Trenches)				
	8.3.2	Excavate in all materials for trenches, backfill, compact and dispose of surplus material for freehaul distance of 5 km:				
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
		over and up to				
10.2.1		b) 1.0 to 2.0 m	m3	43		
10.2.2		c) 2.0 to 3.0 m	m3	100		
10.2.3	8.3.2	Extra over items 2.3.1 for intermediate rock excavation	m3	73		
10.2.4		Extra over items 2.3.1 for hard rock excavation	m3	50		
10.2.5	PDB- 4.1	Controlled blasting	m3	1		
10.2.6	8.3.3	Excavation ancillaries				
10.2.7	8.3.3.1	Make up deficiency in backfill materials	m3	1		
10.2.8	8.3.4 a	Shore trench opposite structures or services	m	2		
10.3	SABS 1200 LB	BEDDING (Pipes) Class B Detail LB-1(b)				
	8.2.1	Provision of Bedding from Trench Excavation				
10.3.1		a) Selected Fill Material	m3	25		
10.3.2	8.2.2	Supply Only of Bedding by Imporation				
		a) From Borrow Pits				
10.3.3		1) Selected Granular Material	m3	1		
10.3.4		2) Selected Fill Material	m3	1		
10.3.5		b) From Commercial Sources				
10.3.6		1) Selected Granular Material	m3	55		
10.4		SUMP REFURBISHMENT				
10.4.1		Expose concrete surface by sandblasting or cleaning with high pressure water jet	m²	55		
10.4.2		Chip out severe cracking in wall & floors and clean (provisional length)	m	50		
10.4.3		Fill cracks with Pro-Struct 525/Sika equivalent	kg	50		
10.4.4		Plaster inside wall with Pro-Struct 514/Sika equivalent, average 4 mm thick	m²	200		
10.4.5		Pro-Struct 514	kg	120		
TOTAL CARRIED FORWARD						

SECTION 10 : MARGATE PUMPSTATION 1 CIVIL WORKS

ITEM	REF	DESCRIPTION
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ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
10.5		PUMPSTATION PIPEWORK AND FITTINGS				
		Supply equipment, ex manuaufacturing works at contractor's premises, including tests in factory				
10.5.1		Supply and install assembled pipe fitting required for pump installation coupling, baseframe and coupling guard	No.	2		
10.5.2		Supply and install discharge piping system including discharge manifold and including gaskets, nuts, bolts, support brackets, and sundry materials, but excluding items measured below	Item	2		
10.5.3		Isolating valve	No.	4		
10.5.4		Non-return valve	No.	2		
10.5.5		Flow switch	No.	2		
10.5.6		Pressure guage, including fittings	No.	2		
10.5.7		Air release valve	No.	2		
10.5.8		Supply and install surge anticipating valve, including isolating valve and dischrge pipe (5m)	Item	2		
10.5.9		Supply and install suction piping systems including including gaskets, nuts, bolts support brackets, and sundry materials, but excluding items measured below	Item	2		
10.5.10		Isolating valves	No.	4		
10.5.11		Pressure guage, including fittings	No.	3		
10.5.12		Strainer	No	3		
10.5.13		Drainage pipe system	Item	2		
10.5.15	8.2.1	Steel pipes to SANS 719 and SABS 63, Grade B, t = 4.5 mm,galvanized & epoxy coated inside & outside, min 250 µm				
		BEF = both ends flanged				
		OEF = one end flanged				
		PF = puddle flange				
		PE = plain ended				
		a) Pipes & pipe specials, Flanges 1600/3 SANS 1123				
		100mm NB				
10.5.16		Suction 45° with flared one end and OEF	No.	2		
10.5.17		L= 800mm straight pipe BEF with PF at centre	No.	2		
10.5.18		L=575mm straight pipe OEF	No.	4		
10.5.19		90° bend L= 405mm BEF	No.	2		
10.5.20		90° bend L= 405mm BEF	No.	2		
10.5.21		L= 2000mm straight pipe BEF	No.	2		
10.5.22		90° bend L= 405mm BEF	No.	2		
10.5.23		Dismantling Joint	No	2		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
10.5.24		Flange adapter	No	4		
10.5.25		90° bend L= 405mm BEF	No.	2		
10.5.26		L= 1000mm straight pipe BEF	No.	2		
10.5.27		Equal Y	No.	1		
10.5.28		L= 800mm straight pipe BEF with PF at centre	No.	2		
10.5.29		Reducer from 150mm to 100mm L=400mm	No.	1		
10.6		PROVISIONAL SUMS				
10.6.1		Allowance for sump for dewatering of pumpstation	Prov Sum	1	25 000.00	25 000.00
		Allow for profit and attendance on the above provisional sum	%	25000		
10.6.2		Allowance for CCTV installation	Prov Sum	1	50 000.00	50 000.00
		Allow for profit and attendance on the above provisional sum	%	50000		
10.6.3		Allowance for rodent control and protection	Prov Sum	1	100 000.00	100 000.00
		Allow for profit and attendance on the above provisional sum	%	100000		
10.6.4		Allowance for Fencing	Prov Sum	1	255 000.00	255 000.00
		Allow for profit and attendance on the above provisional sum	%	255000		
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS
AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 11 : MARGATE PUMPSTATION 1A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
11		SECTION 11 : MARGATE PUMPSTATION 1A				
A		Pumpstation 1A Earthworks				
11.1	8.3.2	Bulk Excavation				
11.1.1		a) Bulk excavation in all materials for pumpstation terrace and place in embankment and compact to 90% AASHTO	m3	42		
11.1.2		Extra-over item 3.2.2.1 for excavation in hard rock	m3	17		
11.1.2	8.3.3	Restricted excavation in all material for:				
11.1.3		a) Pumphouse footings and plinths	m3	15		
11.1.4		b) Excavation for chambers, thrust blocks and other minor structures	m3	5		
11.1.5	8.3.3	Extra-over items 3.2.3.1 & 3.2.3.2 for excavation in hard rock	m3	6		
11.1.6		Backfill with suitable material from excavations to 90% mod AASHTO				
11.1.7		a) To foundations	m3	9		
11.1.8		b) Under surface beds	m3	26		
11.1.9	PB 2	Soil poisoning by the use of Chlorodane or Aldrin type termite soil insecticide	m²	106		
11.1.10		Coarse river sand fill supplied and compacted to 100% Mod AASHTO	m3	11		
11.1.11		Topsoiling and grassing				
11.1.12	8.3.10	Topsoil embankments and around pump station (150 mm thick) from stockpile provided under item 2.2.1.1	m²	25		
11.1.13	8.3.11	Grassing with runners 300mm apart	m²	50		
11.2	SABS 1200 G	CONCRETE				
11.2.1	8.2	Formwork				
11.2.2	8.2.2	Smooth formwork to walls supporting pipes	m²	5		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
11.2.3	8.2.2	Horizontal to underside of roof slab	m ²	10		
11.2.4	8.2.5	Narrow widths to sides of plinths and walls	m	10		
11.2.5	8.3	Reinforcement				
11.2.6	8.3.2	High tensile welded mesh ref 193 reinforcement	m ²	106		
11.2.7	8.3.1	High tensile steel reinforcement of all diameters between 10mm and 25mm	t	3		
11.2.8	8.4	Concrete				
11.2.8.1	8.4.2	50mm to 100 mm Blinding Layer Class 10/12 Concrete	m ²	10		
11.2.8.2	8.4.3	Grade 20/19 concrete to thrust blocks, pumphouse footings, aprons and walls as ordered by the Engineer	m3	30		
11.2.8.3	8.4.3	Grade 30/19 concrete in floor slabs, roof slabs and plinths	m3	25		
11.2.8.4	8.4.3	Grade 30/19 concrete to channel	m3	5		
11.2.9	8.4.4	Unformed surface finishes				
11.2.9.1	8.4.4 b)	Steel float finish to concrete pump bases.	m2	12		
11.2.9.2	8.4.4 b)	Steel float finish to concrete channel.	m	10		
11.2.9.3	8.4.4 c)	Power float finish to pump house floor slab	m ²	123		
11.2.9.4	8.4.4 b)	Steel float to wall narrow widths	m	5		
11.2.9.5	8.4.4 a)	Wood float to concrete apron	m ²	31		
11.2.10	8.5	JOINTS				
11.2.10.1		Two parts grey polysulphide sealant in floor/plinth joint 10mm x 10mm including 13mm bituminous impregnated softboard up to 200mm deep	m	45		
11.2.10.2		Two layers of malthoid laid horizontally on top of walls and underside of roof slab, including mortar bed	m	85		
TOTAL CARRIED FORWARD						

AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 11 : MARGATE PUMPSTATION 1A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
11.3	PBA	BRICKWORK				
		Superstructure				
11.3.1	PBA - 4.1	Brickwall, 330 mm thick cavity wall, clay facebrick in class 1 mortar "Corobrick Fire Light Satin" or similar approved (include hot dipped galvanised wall ties)	m2	92		
11.3.2		One brickwall in NFX bricks	m²	10		
11.3.3		150mm wide brick reinforcement built in horizontally every third course	m	246		
11.3.4		Brick on edge header course over door and window openings	m	3		
11.3.5	PBA - 4.12	Air bricks 230 x 152 clay vermin proof built in	No	5		
11.3.6		233 mm x 175 plastic air vent built in	No	2		
11.3.7	PBA - 4.3	Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 2100 mm long	No	1		
11.3.8		Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 1200mm long	No	11		
11.3.9	PBA - 4.1	Fibre cement window sills 150 x 10 mm to in side face of windows.	m	11.00		
11.3.10	PBA 4.17	WATERPROOFING				
11.3.11		One layer of 375 micron damp proof course 330mm wide in walls	m	31.0		
11.3.12		250 micron USB Green Water proof sheeting under surface beds	m²	20.0		
11.3.13	PB 12	METALWORK D.V. steel door frame and double transformer steel door, 2040W x 3065 H fully louvred Type M, complete with suitable 3 lever lockset built into walls with galvanised vermin proof mesh on the inside (as shown on drawings)	No	1		
11.3.14		Extra over 3.10.2 for purpose made opening 300 x 150mm to permit removal of pumps by use of gantry, including locking device as shown on the drawings	No	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
11.6.5	8.3.2	Extra over items 2.3.1 for intermediate rock excavation	m3	35		
11.6.6		Extra over items 2.3.1 for hard rock excavation	m3	20		
11.6.7	PDB- 4.1	Controlled blasting	m3	1		
11.6.8	8.3.3	Excavation ancillaries				
11.6.9	8.3.3.1	Make up deficiency in backfill materials	m3	1		
11.6.10	8.3.4 a	Shore trench opposite structures or services	m	2		
11.7	SABS 1200 LB	BEDDING (Pipes) Class B Detail LB-1(b)				
11.7.1	8.2.1	Provision of Bedding from Trench Excavation				
11.7.2		a) Selected Fill Material	m3	25		
11.7.3	8.2.2	Supply Only of Bedding by Imporation				
		a) From Borrow Pits				
11.7.4		1) Selected Granular Material	m3	1		
11.7.5		2) Selected Fill Material	m3	1.00		
11.7.6		b) From Commercial Sources				
11.7.7		1) Selected Granular Material	m3	55.00		
11.7.8		SUMP REFURBISHMENT				
11.7.9		Expose concrete surface by sandblasting or cleaning with high pressure water jet	m²	55		
11.7.10		Chip out severe cracking in wall & floors and clean (provisional length)	m	50		
11.7.11		Fill cracks with Pro-Struct 525/Sika equivalent	kg	50		
11.7.12		Plaster inside wall with Pro-Struct 514/Sika equivalent, average 4 mm thick	m²	200		
11.7.13		Pro-Struct 514	kg	120		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
C		PUMPSTATION PIPEWORK AND FITTINGS				
		Pump Station (PS):				
		Supply equipment, ex manufacturing works at contractor's premises, including tests in factory				
11.8.1		Assembled pipe fitting required for pump installation coupling, baseframe and coupling guard	No.	2		
11.8.2		Discharge piping system including discharge manifold and including gaskets, nuts, bolts, support brackets, and sundry materials, but excluding items measured below	Item	2		
11.8.3		Isolating valve	No.	4		
11.8.4		Non-return valve	No.	2		
11.8.5		Flow switch	No.	2		
11.8.6		Pressure guage, including fittings	No.	2		
11.8.7		Air release valve	No.	2.00		
11.8.8		Surge anticipating valve, including isolating valve and dischrge pipe (5m)	Item	2.00		
11.8.9		Suction piping systems including including gaskets, nuts, bolts support brackets, and sundry materials, but excluding items measured below	Item	2.00		
11.8.10		Isolating valves	No.	4.0		
11.8.11		Pressure guage, including fittings	No.	3.0		
11.8.12		Strainer	No	3.0		
11.8.13		Drainage pipe system	Item	2.0		
11.8.14	8.2.1	Steel pipes to SANS 719 and SABS 63, Grade B, t = 4.5 mm,galvanized & epoxy coated inside & outside, min 250 µm				
		BEF = both ends flanged				
		OEF = one end flanged				
		PF = puddle flange				
		PE = plain ended				
		a) Pipes & pipe specials, Flanges 1600/3 SANS 1123				
		NB 100mm				
11.8.14.1		Suction 45° with flared one end and OEF	No.	2		
11.8.14.2		L=4000mm straight pipe OEF	No.	2		
11.8.14.3		90° bend L= 405mm BEF	No.	2		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS
AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 11 : MARGATE PUMPSTATION 1A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
11.8.14.4		S bend BEF L=1500mm	No	2		
11.8.14.5		90° bend L= 405mm BEF	No.	1		
11.8.14.6		Dismantling Joint	No	2		
11.8.14.7		Flange adapter	No	4		
11.8.14.8		NB 150mm				
11.8.14.9		90° bend L= 405mm BEF	No.	1		
11.8.14.10		Equal Tee BEF	No.	1		
11.8.14.11		L=750mm straight pipe OEF	No.	2		
11.8.14.12		Dismantling Joint	No	2		
11.8.14.13		Flange adapter	No	4		
D		PROVISIONAL SUMS				
11.9.1		Allowance for sump for dewatering of pumpstation	Prov Sum	1	25 000.00	25 000.00
11.9.2		Allow for profit and attendance on the above provisional sum	%	25000		
11.9.3		Allowance for CCTV installation	Prov Sum	1	50 000.00	50 000.00
11.9.4		Allow for profit and attendance on the above provisional sum	%	50000		
11.9.5		Allowance for rodent control and protection	Prov Sum	1	20 000.00	20 000.00
11.9.6		Allow for profit and attendance on the above provisional sum	%	20000		
11.9.7		Allowance for Fencing	Prov Sum	1	180 000.00	180 000.00
11.9.8		Allow for profit and attendance on the above provisional sum	%	180000		
11.9.9		Allowance for earthworks, Paving and Retaining Wall	Prov Sum	1	250 000.00	250 000.00
11.9.10		Allow for profit and attendance on the above provisional sum	%	250000		
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 12 : MARGATE PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
11		SECTION 12 : MARGATE PUMPSTATION 3A				
A		Pumpstation 3A Earthworks				
12.1	8.3.2	Bulk Excavation				
12.1.1		a) Bulk excavation in all materials for pumpstation terrace and place in embankment and compact to 90% AASHTO	m3	92		
12.1.2		Extra-over item 3.2.2.1 for excavation in hard rock	m3	37		
12.1.2	8.3.3	Restricted excavation in all material for:				
12.1.3		a) Pumphouse footings and plinths	m3	23		
12.1.4		b) Excavation for chambers, thrust blocks and other minor structures	m3	5		
12.1.5	8.3.3	Extra-over items 3.2.3.1 & 3.2.3.2 for excavation in hard rock	m3	9		
12.1.6		Backfill with suitable material from excavations to 90% mod AASHTO				
12.1.7		a) To foundations	m3	14		
12.1.8		b) Under surface beds	m3	57		
12.1.9	PB 2	Soil poisoning by the use of Chlorodane or Aldrin type termite soil insecticide	m²	230		
12.1.10		Coarse river sand fill supplied and compacted to 100% Mod AASHTO	m3	23		
12.1.11		Topsoiling and grassing				
12.1.12	8.3.10	Topsoil embankments and around pump station (150 mm thick) from stockpile provided under item 2.2.1.1	m²	50		
12.1.13	8.3.11	Grassing with runners 300mm apart	m²	50		
12.2	SABS 1200 G	CONCRETE				
12.2.1	8.2	Formwork				
12.2.2	8.2.2	Smooth formwork to walls	m²	5		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.2.3	8.2.2	Horizontal to underside of roof slab and base slab	m²	10		
12.2.4	8.2.5	Narrow widths to sides of plinths and walls	m	10		
12.2.5	8.3	Reinforcement				
12.2.6	8.3.2	High tensile welded mesh ref 193 reinforcement	m²	230		
12.2.7	8.3.1	High tensile steel reinforcement of all diameters between 10mm and 25mm	t	10		
12.2.8	8.4	Concrete				
12.2.8.1	8.4.2	50mm to 100 mm Blinding Layer Class 10/12 Concrete	m²	10		
12.2.8.2	8.4.3	Grade 20/19 concrete to thrust blocks, pumphouse footings, aprons and walls as ordered by the Engineer	m3	30		
12.2.8.3	8.4.3	Grade 30/19 concrete in floor slabs, roof slabs and plinths	m3	103		
12.2.8.4	8.4.3	Grade 30/19 concrete to channel	m3	5		
12.2.9	8.4.4	Unformed surface finishes				
12.2.9.1	8.4.4 b)	Steel float finish to concrete pump bases.	m2	12		
12.2.9.2	8.4.4 b)	Steel float finish to concrete channel.	m	10		
12.2.9.3	8.4.4 c)	Power float finish to pump house floor slab	m²	600		
12.2.9.4	8.4.4 b)	Steel float to wall narrow widths	m	5		
12.2.9.5	8.4.4 a)	Wood float to concrete apron	m²	45		
12.2.10	8.5	JOINTS				
12.2.10.1		Two parts grey polysulphide sealant in floor/plinth joint 10mm x 10mm including 13mm bituminous impregnated softboard up to 200mm deep	m	45		
12.2.10.2		Two layers of malthoid laid horizontally on top of walls and underside of roof slab, including mortar bed	m	85		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.3	PBA	BRICKWORK				
		Superstructure				
12.3.1	PBA - 4.1	Brickwall, 330 mm thick cavity wall, clay facebrick				
		in class 1 mortar "Corobrick Fire Light Satin" or similar approved (include hot dipped galvanised wall ties)	m2	135		
12.3.2		One brickwall in NFX bricks	m²	10		
12.3.3		150mm wide brick reinforcement built in horizontally every third course	m	365		
12.3.4		Brick on edge header course over door and window openings	m	3		
12.3.5	PBA - 4.12	Air bricks 230 x 152 clay vermin proof built in	No	5		
12.3.6		233 mm x 175 plastic air vent built in	No	2		
12.3.7	PBA - 4.3	Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 2100 mm long	No	1		
12.3.8		Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 1200mm long	No	11		
12.3.9	PBA - 4.1	Fibre cement window sills 150 x 10 mm to in side face of windows.	m	11.00		
12.3.10	PBA 4.17	WATERPROOFING				
12.3.11		One layer of 375 micron damp proof course 330mm wide in walls	m	45.0		
12.3.12		250 micron USB Green Water proof sheeting under surface beds	m²	50.0		
12.3.13	PB 12	METALWORK D.V. steel door frame and double transformer steel door, 2040W x 3065 H fully louvred Type M, complete with suitable 3 lever lockset built into walls with galvanised vermin proof mesh on the inside (as shown on drawings)	No	1		
12.3.15		Extra over 3.10.2 for purpose made opening 300 x 150mm to permit removal of pumps by use of gantry, including locking device as shown on the drawings	No	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.3.16		Windows				
12.3.17		Supply and build in Industrial windows type BLU, 1590 x 745 mm with pressed steel louvres and	No	11		
12.3.18		CRAWL BEAM AND HOIST				
12.3.19	PL.01	Supply and delivery of Monorail (I Beam) Crawler	No	1		
12.3.20	PL.02	Installation, testing and commissioning of Monorail (I Beam) crawler	No	1		
12.2.31	PL.03	Supply and delivery of slewing jib Crane with a maximum load capacity of 1000kg, maximum reach of 4.0 m and Height of 4.0 m, pillar mounted And slew range of 300°	No	1		
12.3.22	PL.04	Installation, testing and commissioning of slewing jib crane	No	1		
12.3.23		EPOXY MORTAR ON FLOORS				
12.3.24	PEF - 4.19	Surface preparation, screeding and curing of floors	m2	115.00		
12.3.25	SABS 1200C	SITE CLEARANCE				
12.3.26	8.2.1	Clear and grub 3.0 width along centre line of pipeline route (Provisional)	m	135.00		
12.3.27	SABS 1200 DB	EARTHWORKS (Pipe Trenches)				
12.3.28	8.3.2	Excavate in all materials for trenches, backfill, compact and dispose of surplus material for freehaul distance of 5 km: over and up to				
12.3.29		b) 1.0 to 2.0 m	m3	43.00		
12.3.30		c) 2.0 to 3.0 m	m3	200		
12.3.31	8.3.2	Extra over items 2.3.1 for intermediate rock excavation	m3	73		
12.3.32		Extra over items 2.3.1 for hard rock excavation	m3	50		
12.3.33	PDB- 4.1	Controlled blasting	m3	1		
TOTAL CARRIED FORWARD						

C.89

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 12 : MARGATE PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.3.34	8.3.3	Excavation ancillaries				
12.3.35	8.3.3.1	Make up deficiency in backfill materials	m3	1		
12.3.36	8.3.4 a	Shore trench opposite structures or services	m	2		
12.4	SABS 1200 LB	BEDDING (Pipes) Class B Detail LB-1(b)				
	8.2.1	Provision of Bedding from Trench Excavation				
12.4.1		a) Selected Fill Material	m3	25		
12.4.2	8.2.2	Supply Only of Bedding by Imporation				
		a) From Borrow Pits				
12.4.3		1) Selected Granular Material	m3	1		
12.4.4		2) Selected Fill Material	m3	1		
12.4.5		b) From Commercial Sources				
12.4.6		1) Selected Granular Material	m3	55		
12.4.7		SUMP REFURBISHMENT				
12.4.8		Expose concrete surface by sandblasting or cleaning with high pressure water jet	m²	55		
12.4.9		Chip out severe cracking in wall & floors and clean (provisional length)	m	50		
12.4.10		Fill cracks with Pro-Struct 525/Sika equivalent	kg	50		
12.4.11		Plaster inside wall with Pro-Struct 514/Sika equivalent, average 4 mm thick	m²	200		
12.4.12		Pro-Struct 514	kg	120		
C		PUMPSTATION PIPEWORK AND FITTINGS				
		Pump Station (PS):				
12.4		Supply equipment, ex manufacturing works at contractor's premises, including tests in factory				
12.4.1		Supply and installed assembled pipe fitting required for pump installation coupling, baseframe and coupling guard	No.	3		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.4.2		Supply and install discharge piping system including discharge manifold and including gaskets, nuts, bolts, support brackets, and sundry materials, but excluding items measured below	Item	3		
12.4.3		Isolating valve	No.	6		
12.4.4		Non-return valve	No.	3		
12.4.4		Flow switch	No.	3		
12.4.5		Pressure guage, including fittings	No.	3		
12.4.6		Air release valve	No.	3.00		
12.4.7		Surge anticipating valve, including isolating valve and dischrge pipe (5m)	Item	3.00		
12.4.8		Suction piping systems including including gaskets, nuts, bolts support brackets, and sundry materials,				
12.5	SANS 1200 L	MEDIUM PRESSURE PIPES				
	8.2.1	Steel pipes to SANS 719 and SABS 63, Grade B, t = 4.5 mm,galvanized & epoxy coated inside & outside, min 250 µm				
		BEF = both ends flanged				
		OEF = one end flanged				
		PF = puddle flange				
		PE = plain ended				
		a) Pipes & pipe specials, Flanges 1600/3 SANS 1123				
		375 mm NB				
12.5.1		Suction 45° with flared one end and OEF	No.	3		
12.5.2		L= 800mm straight pipe BEF with PF at centre	No.	3		
12.5.3		L=575mm straight pipe OEF	No.	6		
12.5.4		375mm x 200mm Reducer BEF L=360	No.	3		
12.5.5		375mm x 200mm Reducer BEF L=1000mm	No.	3		
12.5.6		90° bend L= 405mm BEF	No.	3		
12.5.7.		90° bend L= 405mm BEF	No.	1		
12.5.8		Equal tee BEF	No.	1		
12.5.9		90° bend with welded straight pipe and expander to 450 dia L = 1106 BEF				
12.5.10		Straight pipe with expander to 450 dia L =696 BEF				
12.5.11		Dismantling Joint	No	2		
12.5.12		Flange adapter	No	4		
TOTAL CARRIED FORWARD						

C.91

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

SECTION 12 : MARGATE PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.5.13		450 mm NB				
12.5.14		Equal tee BEF	No.	1		
12.5.15		L=3500m straight pipe BEF	No.	1		
12.5.16		L=2600m straight pipe BEF	No.	1		
12.5.17		L= 800mm straight pipe BEF with PF at centre	No.	1		
12.5.18		L=375mm straight pipe OEF	No.	1		
12.5.19		Unequal tee 450mm x 100mm	No.	1		
12.5.20		Dismantling Joint	No	2		
12.5.21		Flange adapter	No	4		
12.5.22		Strainer	No	3.0		
12.5.23		Drainage pipe system	Item	3.0		
D		PROVISIONAL SUMS				
12.6.1		Allowance for sump for dewatering of pumpstation	Prov Sum	1	25 000.00	25 000.00
12.6.2		Allow for profit and attendance on the above provisional sum	%	25000		
12.6.3		Allowance for CCTV installation	Prov Sum	1	50 000.00	50 000.00
12.6.4		Allow for profit and attendance on the above provisional sum	%	50000		
12.6.5		Allowance for rodent control and protection	Prov Sum	1	100 000.00	100 000.00
12.6.6		Allow for profit and attendance on the above provisional sum	%	100000		
12.6.7		Allowance for Fencing	Prov Sum	1	285 000.00	285 000.00
12.6.8		Allow for profit and attendance on the above provisional sum	%	285000		
12.6.9		Allowance for earthworks, Paving and Retaining Wall	Prov Sum	1	180 000.00	180 000.00
12.6.10		Allow for profit and attendance on the above provisional sum	%	180000		
TOTAL CARRIED TO SUMMARY						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
 EFFLUENT MAIN (PHASE1)
 CONTRACT No: UGU-07-1683-2024
 SECTION 13 : MARGATE PUMPSTATION 4A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
13		SECTION 13 : MARGATE PUMPSTATION 4A				
A		Pumpstation 4A Earthworks				
13.1	8.3.2	Bulk Excavation				
13.1.1		a) Bulk excavation in all materials for pumpstation terrace and place in embankment and compact to 90% AASHTO	m3	62		
13.1.2		Extra-over item 3.2.2.1 for excavation in hard rock	m3	25		
13.1.2	8.3.3	Restricted excavation in all material for:				
13.1.3		a) Pumphouse footings and plinths	m3	19		
13.1.4		b) Excavation for chambers, thrust blocks and other minor structures	m3	5		
13.1.5	8.3.3	Extra-over items 3.2.3.1 & 3.2.3.2 for excavation in hard rock	m3	7		
13.1.6		Backfill with suitable material from excavations to 90% mod AASHTO				
13.1.7		a) To foundations	m3	11		
13.1.8		b) Under surface beds	m3	39		
13.1.9	PB 2	Soil poisoning by the use of Chlorodane or Aldrin type termite soil insecticide	m²	154		
13.1.10		Coarse river sand fill supplied and compacted to 100% Mod AASHTO	m3	15		
13.1.11		Topsoiling and grassing				
13.1.12	8.3.10	Topsoil embankments and around pump station (150 mm thick) from stockpile provided under item 2.2.1.1	m²	50		
13.1.13	8.3.11	Grassing with runners 300mm apart	m²	50		
13.2	SABS 1200 G	CONCRETE				
13.2.1	8.2	Formwork				
13.2.2	8.2.2	Smooth formwork to walls	m²	5		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
13.2.3	8.2.2	Horizontal to underside of roof slab and base slab	m²	403		
13.2.4	8.2.5	Narrow widths to sides of plinths and walls	m	10		
13.2.5	8.3	Reinforcement				
13.2.6	8.3.2	High tensile welded mesh ref 193 reinforcement	m²	154		
13.2.7	8.3.1	High tensile steel reinforcement of all diameters between 10mm and 25mm	t	8		
13.2.8	8.4	Concrete				
13.2.8.1	8.4.2	50mm to 100 mm Blinding Layer Class 10/12 Concrete	m²	10		
13.2.8.2	8.4.3	Grade 20/19 concrete to thrust blocks, pumphouse footings, aprons and walls as ordered by the Engineer	m3	30		
13.2.8.3	8.4.3	Grade 30/19 concrete in floor slabs, roof slabs and plinths	m3	77		
13.2.8.4	8.4.3	Grade 30/19 concrete to channel	m3	5		
13.2.9	8.4.4	Unformed surface finishes				
13.2.9.1	8.4.4 b)	Steel float finish to concrete pump bases.	m2	12		
13.2.9.2	8.4.4 b)	Steel float finish to concrete channel.	m	10		
13.2.9.3	8.4.4 c)	Power float finish to pump house floor slab	m²	444		
13.2.9.4	8.4.4 b)	Steel float to wall narrow widths	m	5		
13.2.9.5	8.4.4 a)	Wood float to concrete apron	m²	37		
13.2.10	8.5	JOINTS				
13.2.10.1		Two parts grey polysulphide sealant in floor/plinth joint 10mm x 10mm including 13mm bituminous impregnated softboard up to 200mm deep	m	45		
13.2.10.2		Two layers of malthoid laid horizontally on top of walls and underside of roof slab, including mortar bed	m	85		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
13.3	PBA	BRICKWORK				
		Superstructure				
13.3.1	PBA - 4.1	Brickwall, 330 mm thick cavity wall, clay facebrick in class 1 mortar "Corobrick Fire Light Satin" or similar approved (include hot dipped galvanised wall ties)	m2	112		
13.3.2		One brickwall in NFX bricks	m²	10		
13.3.3		150mm wide brick reinforcement built in horizontally every third course	m	300		
13.3.4		Brick on edge header course over door and window openings	m	3		
13.3.5	PBA - 4.12	Air bricks 230 x 152 clay vermin proof built in	No	5		
13.3.6		233 mm x 175 plastic air vent built in	No	2		
13.3.7	PBA - 4.3	Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 2100 mm long	No	1		
13.3.8		Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 1200mm long	No	11		
13.3.9	PBA - 4.1	Fibre cement window sills 150 x 10 mm to in side face of windows.	m	11.00		
13.3.10	PBA 4.17	WATERPROOFING				
13.3.11		One layer of 375 micron damp proof course 330mm wide in walls	m	37.0		
13.3.12		250 micron USB Green Water proof sheeting under surface beds	m²	50.0		
13.3.13	PB 12	METALWORK D.V. steel door frame and double transformer steel door, 2040W x 3065 H fully louvred T type M, complete with suitable 3 lever lockset built into walls with galvanised vermin proof mesh on the inside (as shown on drawings)	No	1		
13.3.15		Extra over 3.10.2 for purpose made opening 300 x 150mm to permit removal of pumps by use of gantry, including locking device as shown on the drawings	No	1		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
12.3.16		Windows				
12.3.17		Supply and build in Industrial windows type BLU, 1590 x 745 mm with pressed steel louvres and	No	11		
12.3.18		CRAWL BEAM AND HOIST				
12.3.19	PL.01	Supply and delivery of Monorail (I Beam) Crawler	No	1		
12.3.20	PL.02	Installation, testing and commissioning of Monorail (I Beam) crawler	No	1		
12.3.21	PL.03	Supply and delivery of slewing jib Crane with a maximum load capacity of 1000kg, maximum reach of 4.0 m and Height of 4.0 m, pillar mounted And slew range of 300°	No	1		
12.3.22	PL.04	Installation, testing and commissioning of slewing jib crane	No	1		
12.3.23		EPOXY MORTAR ON FLOORS				
12.3.24	PEF - 4.19	Surface preparation, screeding and curing of floors	m2	77.00		
12.4	SABS 1200C	SITE CLEARANCE				
12.4.1	8.2.1	Clear and grub 3.0 width along centre line of pipeline route (Provisional)	m	135.00		
12.4.1	SABS 1200 DB	EARTHWORKS (Pipe Trenches)				
12.4.2	8.3.2	Excavate in all materials for trenches, backfill, compact and dispose of surplus material for freehaul distance of 5 km:				
		over and up to				
12.4.3		b) 1.0 to 2.0 m	m3	43.00		
12.4.4		c) 2.0 to 3.0 m	m3	200		
12.4.5	8.3.2	Extra over items 2.3.1 for intermediate rock excavation	m3	73		
12.4.6		Extra over items 2.3.1 for hard rock excavation	m3	50		
12.4.7	PDB- 4.1	Controlled blasting	m3	1		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND
EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 13 : MARGATE PUMPSTATION 4A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
13.3.34	8.3.3	Excavation ancillaries				
13.3.35	8.3.3.1	Make up deficiency in backfill materials	m3	1		
13.3.36	8.3.4 a	Shore trench opposite structures or services	m	2		
13.4	SABS 1200 LB	BEDDING (Pipes) Class B Detail LB-1(b)				
	8.2.1	Provision of Bedding from Trench Excavation				
13.4.1		a) Selected Fill Material	m3	25		
13.4.2	8.2.2	Supply Only of Bedding by Imporation				
		a) From Borrow Pits				
13.4.3		1) Selected Granular Material	m3	1		
13.4.4		2) Selected Fill Material	m3	1		
13.4.5		b) From Commercial Sources				
13.4.6		1) Selected Granular Material	m3	55		
13.4.7		SUMP REFURBISHMENT				
13.4.8		Expose concrete surface by sandblasting or cleaning with high pressure water jet	m²	55		
13.4.9		Chip out severe cracking in wall & floors and clean (provisional length)	m	50		
13.4.10		Fill cracks with Pro-Struct 525/Sika equivalent	kg	50		
13.4.11		Plaster inside wall with Pro-Struct 514/Sika equivalent, average 4 mm thick	m²	200		
13.4.12		Pro-Struct 514	kg	120		
C		PUMPSTATION PIPEWORK AND FITTINGS				
13.5		Supply equipment, ex manufacturing works at contractor's premises, including tests in factory				
13.5.1		Supply and install assembled pipe fitting required for pump installation coupling, baseframe and coupling guard	No.	3		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
13.5.2		Discharge piping system including discharge manifold and including gaskets, nuts, bolts, support brackets, and sundry materials, but excluding items measured below	Item	3		
13.5.3		Isolating valve	No.	6		
13.5.4		Non-return valve	No.	3		
13.5.5		Flow switch	No.	3		
13.5.6		Pressure guage, including fittings	No.	3		
13.5.7		Air release valve	No.	3		
13.5.8		Surge anticipating valve, including isolating valve and dischrge pipe (5m)	Item	3		
13.5.9		Suction piping systems including including gaskets, nuts, bolts support brackets, and sundry materials, but excluding items measured below	Item	3		
13.5.9.1		Isolating valves	No.	6		
13.5.9.2		Pressure guage, including fittings	No.	3		
13.5.9.3		Strainer	No	3		
13.5.9.4		Drainage pipe system	Item	3		
13.6	SANS 1200 L	MEDIUM PRESSURE PIPES				
	8.2.1	Steel pipes to SANS 719 and SABS 63, Grade B, t = 4.5 mm,galvanized & epoxy coated inside & outside, min 250 µm				
		BEF = both ends flanged				
		OEF = one end flanged				
		PF = puddle flange				
		PE = plain ended				
		a) Pipes & pipe specials, Flanges 1600/3 SANS 1123				
		250mm NB				
13.6.1		Suction 45° with flared one end and OEF	No.	3		
13.6.2		L= 800mm straight pipe BEF with PF at centre	No.	3		
13.6.3		L=575mm straight pipe OEF	No.	6		
13.6.4		90° bend L= 405mm BEF	No.	3		
13.6.5		250 to 150 Reducer L=300mm BEF	No.	6		
13.6.6		90° bend L= 405mm BEF	No.	3		
13.6.7		L= 2000mm straight pipe BEF	No.	3		
13.6.8		90° bend L= 405mm BEF	No.	3		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
13.6.9		Dismantling Joint	No	2		
13.6.9		Flange adapter	No	4		
		400mm NB				
13.6.10		Unequal Tee 400mm x 250mm with 250mm pipe entry at 60°	No.	2		
13.6.11		L= 800mm straight pipe BEF with PF at centre	No.	1		
13.6.12		Dismantling Joint	No	2		
13.6.13		Flange adapter	No	4		
D		PROVISIONAL SUMS				
13.7.1		Allowance for sump for dewatering of pumpstation	Prov Sum	1	25 000.00	25 000.00
13.7.2		Allow for profit and attendance on the above provisional sum	%	25000		
13.7.3		Allowance for CCTV installation	Prov Sum	1	50 000.00	50 000.00
13.7.4		Allow for profit and attendance on the above provisional sum	%	50000		
13.7.5		Allowance for rodent control and protection	Prov Sum	1	20 000.00	20 000.00
13.7.6		Allow for profit and attendance on the above provisional sum	%	20000		
13.7.7		Allowance for the repair of existing 450mm Raising main	Prov Sum	1	285 000.00	285 000.00
13.7.8		Allow for profit and attendance on the above provisional sum	%	285000		
TOTAL CARRIED TO SUMMARY						

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REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 14 : RISING MAIN FROM PUMPSTATION 1 TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
14.2.1	8.3.3.1(a)	a) From other necessary excavations on site	m³	258		
14.2.1	8.3.3.1(c)	b) By importation from commercial or off-site sources selected by the Contractor	m³	1035		
14.2.3	8.3.3.3	c) Compaction in road reserves, only where instructed in writing by the Engineer.	m³	109		
14.3		EXISTING SERVICES				
14.3.1	8.3.5(a)	Services that intersect a trench				
14.3.2		a) Cables	No.	50		
14.3.3		b) Water pipes	No.	50		
14.3.4		c) Stormwater pipes up to 750 mm	No.	10		
14.3.5	8.3.5(b)	Services that adjoin a trench				
14.3.6		a) Power pole	No	5		
14.4	8.3.6	FINISHINGS				
14.4.1	8.3.6.1	Reinstate road surfaces				
14.4.2		a) Complete with all courses except surfacing	m²	516		
14.4.3		b) Asphalt 30mm thick on roadway	m²	516		
14.4.4.1		c) Reinstatement of Road Marking	Prov Sum	1	10 000.00	10 000.00
14.4.4.2		Allow for profit and attendance on the above provisional sum	%	10000		
14.4.4.3	8.3.7	Accommodation of traffic	Sum	1		
14.4.5		Horizontal Direction drilling (Provisional)				
14.4.6		All material, plant and labour required to carry out horizontal drilling and install 250Ø HDPE sleeve under asphalt roads for 160Ø uPVC pipes (Average length of 15m). Depth and gradient of sleeve to be determined from long sections.	No	1		
14.5	SANS 1200M	REINSTATEMENT OF EXISTING PAVING SUBBASE Construct gravel subbase with material from commercial source				
14.5.1		150mm thick G7 and compact to 95% Mod AASHTO	m²	688		
14.5.2		Rlp and recompact insitu to 93% Mod AASHTO	m²	688		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)
CONTRACT No: UGU-07-1683-2024
SECTION 14 : RISING MAIN FROM PUMPSTATION 1 TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
14.6		BASE				
		Construct base with gravel material from borrow pits				
14.6.1		150 mm G2 to main parking area, access road and sidewalks, compact to 98% Mod AASHTO	m³	103		
14.6.2		150 mm G5 to main roadways and compact to 98% Mod AASHTO	m³	103		
14.6.3		Process base by means of:				
14.6.4		d) Stabilization	m³	103		
14.6.5		Stabilizing agent				
14.6.6		Portland cement	t	15.5		
14.6.7		SEGMENTED PAVING				
14.6.7		Supply and lay 20mm thick Riversand bedding	m³	11		
14.6.8		Reinstatement of Existing Paving	m³	688		
		CONSTRUCT PRECAST CONCRETE SEGMENTED PAVING COMPLETE				
14.6.9		a) 60mm interlocking blocks, SANS approved, parking and sidewalks, including levelling and jointing sand	m²	262		
		PROVIDE CAST INSITU EDGE RESTRAINTS ALONG EDGE WHERE NO KERB IS PRESENT				
14.6.10		a) Cast insitu edge restraint	m³	23		
14.6.11		CUT UNITS TO FIT EDGE RESTRAINTS	m	113		
		KERB AND CHANNEL				
		CONCRETE KERBING AND CHANNELLING				
14.6.12		Fig 6 Precast concrete kerb complete with 300mm cast insitu channel and continuous concrete haunching	m	602		
14.6.13		Construct 12m wide cast insitu concrete vehicular scoop	No.	3		
	SABS 1200 LB	SECTION 3 : BEDDING (PIPES)				
14.7		PROVISION OF BEDDING				
	8.2.1	Available from trench within 0,5 km (Subclause 3.4.1)				
14.7.1		a) Selected granular bedding material	m³	35		
14.7.2		b) Selected fill blanket material	m³	39		
	8.2.2.3	Provision of bedding from designated borrow pits (unlimited freehaul) and place in stockpile at 100m intervals along trench (Provisional items).				
14.7.3		a) Selected granular material	m³	24		
14.7.4		b) Selected fill material	m³	26		
	8.2.2.3	From commercial sources				
14.7.5		a) Selected granular material	m³	212		
14.7.6		b) Selected fill material	m³	222		
14.7.7		c) stone bedding (19mm stone, wrapped in A4 bidum)	m³	258		
TOTAL CARRIED FORWARD						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
14.8	SABS	SECTION 4: SEWERS				
B		Pipework and Manholes				
14.8.1	1200 LD	PIPEWORK				
	8.2.1	a) Supply, lay, joint and bed (flexible bedding) and test pipelines:				
14.8.2		i) 110mm Ø uPVC Class 34	m	50		
14.8.3		ii) 160mm Ø uPVC Class 34	m	810		
	8.2.2	Extra-over items 8.22.6 - 8.22.10 :				
14.8.4		160mm Ø Bends	No.	41		
14.8.5		160mm Ø Junctions	No.	5		
14.8.6		Encasing of pipes in concrete (19/19)	m³	10		
14.8.7		Marker posts, complete, installed, records taken	No.	41		
14.8.8		Permanent plug stoppers	No.			
14.8.9		Allowance for Jetting of Sewer Line	Prov Sum	1	65 000.00	65 000.00
14.8.10		Handling cost and Profit in respect of Subitem (4.2.26) above	%	65000		
14.8.11		Allowance for Installation of air valves	Prov Sum	1	50 000.00	50 000.00
14.8.12		Handling cost and Profit in respect of Subitem (4.2.26) above	%	50000		
14.8.13		Allowance for connection to existing sewer system	Prov Sum	1	65 000.00	65 000.00
14.8.14		Handling cost and Profit in respect of Subitem (4.2.26) above	%	65000		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 15 : GRAVITY MAIN PUMPSTATION A TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION
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15		SECTION 15 : GRAVITY MAIN PUMPSTATION A TO PUMPSTATION 3A					
A		Earthworks					
	SABS 1200 DB	SECTION 2 : PIPE TRENCHES					
15.1		SITE CLEARANCE					
	8.3.1	Site Clearance removal of topsoil					
15.1.1		a) Clear vegetation and trees of girth 1m.	m	963			
15.1.2		b) Remove Topsoil to 150mm depth	m2	963			
15.1.3		c) Topsoiling	m2	963			
15.1.4		EXCAVATION					
15.1.5	8.3.2(a)	Excavate in all materials for trenches backfill, compact, and dispose of surplus/unsuitable material, for uPVC pipes from 110mm up to 200 mm diam. for total trench depth:					
15.1.5.1		a) Exceeding 0,0 m but not exceeding 1,0 m (labour intensive)	m	96			
15.1.5.2		b) Exceeding 1,0 m but not exceeding 2,0 m (labour intensive and including shoring/battering as applicable/dewatering)	m	433			
15.1.5.3		c) Exceeding 2,0 m but not exceeding 3,0 m (machine exc. and including shoring/battering as applicable/dewatering)	m	289			
15.1.5.4		d) Exceeding 3,0 m but not exceeding 4,0 m (machine exc. and including shoring/battering as applicable/dewatering)	m	96			
15.1.5.5		e) Exceeding 4,0 m but not exceeding 5,0 m (machine exc. and including shoring/battering as applicable/dewatering)	m	48			
15.1.6	8.3.2(b)	Extra over 15.1.5-15.1.5.5 for:-					
15.1.6.1	8.3.2 (b)	1) Intermediate excavation (provisional)	m³	191			
15.1.6.2		2) Hard rock	m³	636			
15.1.6.3	8.3.2 (b)	Boulder Class A excavation (provisional)	m³	254			
15.1.6.4	8.3.2 (b)	Boulder Class B excavation (provisional)	m³	64			
15.1.6.5	8.3.2	Hand excavation and backfill where ordered by the Engineer	m³	65			
15.1.7	8.3.2(c)	Excavate and dispose of unsuitable material from trench bottom (Provisional)	m³	127			
15.1.8		Excavation across surfaced roads (Provisional)	m³	127			
15.1.9		EXCAVATION. ANCILLARIES Make up deficiency in backfill material :(Provisional)					
15.1.10	8.3.3.1(a)	a) From other necessary excavations on site	m³	228			
15.1.11	8.3.3.1(c)	b) By importation from commercial or off-site sources selected by the Contractor	m³	915			
15.1.12	8.3.3.3	c) Compaction in road reserves, only where instructed in writing by the Engineer.	m³	127			
TOTAL CARRIED FORWARD							

SECTION 15 : GRAVITY MAIN PUMPSTATION A TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
15.2.		EXISTING SERVICES				
	8.3.5(a)	Services that intersect a trench				
15.2.1		a) Cables	No.	50		
15.2.2		b) Water pipes	No.	50		
15.2.3		c) Stormwater pipes up to 750 mm	No.	10		
	8.3.5(b)	Services that adjoin a trench				
15.2.4		a) Power pole	No	5		
15.2.5	8.3.6	FINISHINGS				
15.2.5.1	8.3.6.1	Reinstate road surfaces				
15.2.5.2		a) Complete with all courses except surfacing	m²	1155		
15.2.5.3		b) Asphalt 30mm thick on roadway	m²	1155		
15.2.5.4		c) Reinstatement of Road Marking Allow for profit and attendance on the above	Prov	1	10 000.00	10 000.00
15.2.5.5		provisional sum	%	10000		
15.2.6		Horizontal Direction drilling (Provisional)				
		All material, plant and labour required to carry out horizontal drilling and install 250Ø HDPE sleeve under asphalt roads for 160Ø uPVC pipes (Average length of 15m). Depth and gradient of sleeve to be determined from long sections.				
15.2.7			No	1		
	SANS 1200M	REINSTATEMENT OF EXISTING PAVING SUBBASE Construct gravel subbase with material from commercial source				
15.2.7.1		150mm thick G7 and compact to 95% Mod AASHTO	m³	385		
15.2.7.2		Rlp and recompact insitu to 93% Mod AASHTO	m²	385		
15.2.7.4		BASE Construct base with gravel material from borrow pits				
15.2.7.5		150 mm G2 to main parking area, access road and sidewalks, compact to 98% Mod AASHTO	m³	58		
15.2.7.6		150 mm G5 to main roadways and compact to 98% Mod AASHTO	m³	58		
		Process base by means of:				
15.2.7.7		d) Stabilization	m³	58		
15.2.7.8		Stabilizing agent				
15.2.7.9		Portland cement	t	8.7		
		SEGMENTED PAVING				
15.2.7.10		Supply and lay 20mm thick Riversand bedding	m³	2.3		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

SECTION 15 : GRAVITY MAIN PUMPSTATION A TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
15.2.7.11		Reinstatement of Existing Paving	m³	385		
		CONSTRUCT PRECAST CONCRETE SEGMENTED PAVING complete				
15.2.7.12		a) 60mm interlocking blocks, SANS approved, parking and sidewalks, including levelling and jointing sand	m²	385		
		PROVIDE CAST INSITU EDGE RESTRAINTS ALONG EDGE WHERE NO KERB IS PRESENT				
15.2.7.13		a) Cast insitu edge restraint	m³	161		
15.2.7.14		CUT UNITS TO FIT EDGE RESTRAINTS	m	81		
		KERB AND CHANNEL				
		CONCRETE KERBING AND CHANNELLING				
15.2.7.15		Fig 6 Precast concrete kerb complete with 300mm cast insitu channel and continuous concrete haunching	m	780		
15.2.7.16		Construct 12m wide cast insitu concrete vehicular scoop	No.	3		
	SABS 1200 LB	SECTION 3 : BEDDING (PIPES)				
15.3		PROVISION OF BEDDING				
	8.2.1	Available from trench within 0,5 km (Subclause 3.4.1)				
15.3.1		a) Selected granular bedding material	m³	20		
15.3.2		b) Selected fill blanket material	m³	23		
	8.2.2.3	Provision of bedding from designated borrow pits (unlimited freehaul) and place in stockpile at 100m intervals along trench (Provisional items).				
15.3.3		a) Selected granular material	m³	10		
15.3.4		b) Selected fill material	m³	11		
	8.2.2.3	From commercial sources				
15.3.5		a) Selected granular material	m³	187		
15.3.6		b) Selected fill material	m³	208		
15.3.7		c) stone bedding (19mm stone, wrapped in A4 bidum)	m³	290		
15.4	SABS	SECTION 4: SEWERS				
B	1200 LD	PIPEWORK				
	8.2.1	a) Supply, lay, joint and bed (flexible bedding) and test pipelines:				
15.4.1		i) 110mm Ø uPVC Class 34	m	50		
15.4.2		ii) 160mm Ø uPVC Class 34	m	913		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

SECTION 15 : GRAVITY MAIN PUMPSTATION A TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
	8.2.2	Extra-over items 8.22.6 - 8.22.10 :				
15.4.3		160mm Ø Bends	No.	47		
15.4.4		160mm Ø Junctions	No.	5		
15.4.5	1200 LD 8.2.3	MANHOLES, ETC. Manholes to Dwg No. 28001/2/9901 complete with concrete cover and frame, for depths over and up to				
15.4.5.1		i) 0,0 m to 1,0 m	No.	10		
15.4.5.2		ii) 1,0 m to 2,0 m	No.	4		
15.4.5.3		iii) 2,0 m to 3,0 m	No.	4		
15.4.5.4		iv) 3,0 m to 4,0 m	No.	4		
15.4.5.5		v) 4,0 m to 5,0 m	No.	4		
15.4.5.1	8.2.4	Extra-over item for construction of backdrops and ramps including extra excavation, formwork, joints, pipe junctions etc., to Dwg No. 28001/2/9901. for depths over and up to :				
15.4.5.2		0,2 m - 0,5 m (ramp)	No.	8		
15.4.5.3		0,5 m - 1,0 m	No.	4		
15.4.5.4		1,0 m to 2,0 m	No.	4		
15.4.5.5		2,0 m to 3,0 m	No.	4		
15.4.6.5		3,0 m to 4,0 m	No.	4		
15.4.7		Extra-over item for heavy duty cover and frame in road reserves. a) Type 2A Cast Iron	No.	24		
	8.2.6	Erf Connections Direct				
15.4.8		Inspection Eyes	No.	11		
15.4.9		Inspection Chambers	No.	5		
15.4.10		Connecting Sewer: Direct Connection	No.	25		
15.4.11		Connecting Sewer: Sloping Connection 1m	No.	25		
15.4.12		Connecting Sewer: Sloping Connection 2m	No.	25		
15.4.12		Connecting Sewer: Sloping Connection 3m	No.	25		
15.4.13		Supply and install air vent for the release of H2S gas((Provisional)	No.	25		
TOTAL CARRIED FORWARD						

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REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 15 : GRAVITY MAIN PUMPSTATION A TO PUMPSTATION 3A

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
15.4.14		Connecting Sewer: Sloping Connection 4m	No.	25		
15.4.15		Encasing of pipes in concrete (19/19)	m³	10		
15.4.16		Marker posts, complete, installed, records taken	No.	46		
15.4.17		Permanent plug stoppers	No.	10		
15.4.18		Allowance for Jetting of Sewer Line	Prov Sum	1	65 000.00	65 000.00
15.4.19		Handling cost and Profit in respect of Subitem above	%	65000		
15.4.20		Allowance for connection to existing sewer system	Prov Sum	1	65 000.00	65 000.00
15.4.21		Handling cost and Profit in respect of Subitem above	%	65000		
TOTAL CARRIED TO SUMMARY						

ITEM	REF	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BALANCE BROUGHT FORWARD						
16	8.3.5(a)	Services that intersect a trench				
16.2.1		a) Cables	No.	50		
16.2.2		b) Water pipes	No.	50		
16.2.3		c) Stormwater pipes up to 750 mm	No.	10		
	8.3.5(b)	Services that adjoin a trench				
16.2.4		a) Power pole	No	5		
16.2.5	8.3.6	FINISHINGS				
16.2.5.1	8.3.6.1	Reinstate road surfaces				
16.2.5.2		a) Complete with all courses except surfacing	m²	1413		
16.2.5.3		b) Asphalt 30mm thick on roadway	m²	1413		
16.2.5.4		c) Reinstatement of Road Marking	PC Sum	1	20 000.00	20 000.00
16.2.5.5		Contractor's markup on item above	%	20000		
16.2.6		Horizontal Direction drilling				
16.2.7		All material, plant and labour required to carry out horizontal drilling and install 250Ø HDPE sleeve under asphalt roads for 160Ø uPVC pipes (Average length of	No	1		
16.2.7	SANS 1200M	REINSTATEMENT OF EXISTING PAVING SUBBASE Construct gravel subbase with material from commercial source				
16.2.7.1		150mm thick G7 and compact to 95% Mod AASHTO	m³	353		
16.2.7.2		Rlp and recompact insitu to 93% Mod AASHTO	m²	353		
16.2.7.4		BASE Construct base with gravel material from borrow pits				
16.2.7.5		150 mm G2 to main parking area, access road and sidewalks, compact to 98% Mod AASHTO	m³	53		
16.2.7.6		150 mm G5 to main roadways and compact to 98% Mod AASHTO	m³	53		
16.2.7.7		Process base by means of: d) Stabilization	m³	53		
16.2.7.8		Stabilizing agent				
16.2.7.9		Portland cement	t	8		
16.2.7.10		SEGMENTED PAVING Supply and lay 20mm thick Riversand bedding	m³	15		
16.2.7.11		Reinstatement of Existing Paving	m³	353		
16.2.7.12		CONSTRUCT PRECAST CONCRETE SEGMENTED PAVING complete a) 60mm interlocking blocks, SANS approved, parking and sidewalks, including levelling and jointing sand	m²	353		
TOTAL CARRIED FORWARD						

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND

EFFLUENT MAIN (PHASE1)

CONTRACT No: UGU-07-1683-2024

SECTION 16 : GRAVITY SEWER RETICULATION

TOTAL CARRIED FORWARD

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE1)

SECTION 16 : GRAVITY SEWER RETICULATION

ITEM	REF	DESCR
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BALANCE BROUGHT FORWARD						
16.4.10		Connecting Sewer: Direct Connection	No.	40		
16.4.11		Connecting Sewer: Sloping Connection 1m	No.	40		
16.4.12		Connecting Sewer: Sloping Connection 2m	No.	40		
16.4.12		Connecting Sewer: Sloping Connection 3m	No.	40		
16.4.13		Connecting Sewer: Sloping Connection 4m	No.	40		
16.4.14		Encasing of pipes in concrete (19/19)	m³	10		
16.4.15		Supply and install air vent for the release of H2S gas((Provisional)	No.	40		
16.4.16		Marker posts, complete, installed, records taken	No.	46		
16.4.17		Permanent plug stoppers	No.	10		
16.4.18		Allowance for Jetting of Sewer Line	Psum	1	65 000.00	65 000.00
16.4.19		Handling cost and Profit in respect of Subitem (4.2.26) above	%	65000		
16.4.20		Allowance for connection to existing sewer system	Prov Sum	1	65 000.00	65 000.00
16.4.21		Handling cost and Profit in respect of Subitem (4.2.26) above	%	65000		
16.4.22		Allowance for connection to existing sewer system	Prov Sum	1	65 000.00	65 000.00
16.4.23		Handling cost and Profit in respect of Subitem (4.2.26) above	%	65000		
TOTAL CARRIED TO SUMMARY						

C2.2 BILL OF QUANTITIES**SUMMARY OF BILL OF QUANTITIES**

SECTION 1	PRELIMINARY & GENERAL.....	R.....
SECTION 2	WWTW MECHANICAL WORKS.....	R.....
SECTION 3	ELECTRICAL MECHANICAL & INSTRUMENTATION (WWTW).....	R.....
SECTION 4	WWTW CIVIL WORKS.....	R.....
SECTION 5	ELECTRICAL MECHANICAL & INSTRUMENTATION (PUMPSTATIONS).....	R.....
SECTION 6	ELECTRICAL MECHANICAL & INSTRUMENTATION (STAND-BY GENERATORS AND TRANSFORMER).....	R.....
SECTION 7	ELECTRICAL MECHANICAL & INSTRUMENTATION (SITE & GENERAL , SITE LIGHTING AND PROV SUMS).....	R.....
SECTION 8	ELECTRICAL MECHANICAL & INSTRUMENTATION (SEWER PUMP STATIONS - PUMPING PLANTS).....	R.....
SECTION 9	EFFLUENT MAIN.....	R.....
SECTION 10	MARGATE PUMPSTATION 1.....	R.....
SECTION 11	MARGATE PUMPSTATION 1A.....	R.....
SECTION 12	MARGATE PUMPSTATION 3A.....	R.....
SECTION 13	MARGATE PUMPSTATION 4A.....	R.....
SECTION 14	RISING MAIN PS 1 TO PS 3A.....	R.....
SECTION 15	GRAVITY MAIN PS 1 TO PS 3A.....	R.....
SECTION 16	GRAVITY SEWER RETICULATION.....	R.....
SUBTOTAL A		R.....
ADD CONTINGENCIES @ 10 %.....		R.....
SUBTOTAL B		R.....
ADD CONTRACT PRICE ADJUSTMENT @ 5 %		R.....
SUBTOTAL C		R.....
ADD VAT @ 15 %		R.....
TOTAL CARRIED TO THE FORM OF OFFER ON PAGE C.2.....		R.....

SIGNED ON BEHALF OF TENDERER:

C3 SCOPE OF WORK

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C3.1 STANDARD SPECIFICATIONS

C3.2 PROJECT SPECIFICATIONS

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- PS.1 Project Description
- PS.2 Description of The Site and Access
- PS.3 Construction and Management Requirements
- PS.4 PROJECT REQUIREMENTS
- PS.5 ELECTRICAL & INSTRUMENTATION PROJECT SPECIFICATION

B: AMENDMENTS TO THE STANDARD SPECIFICATIONS

- PSA GENERAL
- PSAB OFFICE
- PSC SITE CLEARANCE
- PSD EARTHWORKS
- PSDB EARTHWORKS (PIPE TREANCHES)
- PSDK GABIONS AND PITCHING
- PSDM EARTHWORKS (ROADS, SUGGRADE)
- PSG STRUCTURAL CONCRETE
- PSGA CONCRETE (SMALL WORKS)
- PSHA STRUCTURAL STEELWORK
- PSL MEDIUM PRESSURE PIPELINES
- PSLB BEDDING PIPELINES
- PSLC CABLE DUCTS
- PSLD SEWER
- PSLE STORM WATER DRAINAGE
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- PSMJ SEGMENTED PAVING
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C: ADDITIONAL PARTICULAR SPECIFICATIONS

PA: SECURITY FENCING

PB: OHS 1993: HEALTH AND SAFETY SPECIFICATION

PC: ENVIRONMENTAL MANAGEMENT SPECIFICATION

PD: EPWP REQUIREMENTS

PG: STERILISATION OF TANKS AND RESERVOIRS

PSD 2: PUMPS

GS 1: STANDARD SPECIFICATION FOR DB's AND MOTOR CONTROL CENTRES

C3.1 STANDARD SPECIFICATIONS

The standard specifications on which this contract is based are the **SABS 1200 Standardized Specifications**.

Although not bound in nor issued with this Document, the following Parts of the SABS 1200 Standardized Specifications shall apply:

SABS 1200 A:	General (1986)
SABS 1200 AB:	Engineers Office (1986)
SABS 1200 C:	Site Clearance (1980)
SABS 1200 D:	Earthworks (1988)
SABS 1200 DB:	Earthworks (Pipe Trenches) (1989)
SABS 1200 DK:	Gabions and Pitching (1996)
SABS 1200 G:	Concrete (Structural) (1982)
SABS 1200 GA:	Concrete (Small Works) (1982)
SABS 1200 L:	Medium-Pressure Pipelines (1983)
SABS 1200 LB:	Bedding (Pipes) (1983)
SABS 1200 LE:	Stormwater drainage (1982)

Variations and additions to the various SABS 1200 Standardised Specifications are given in Portion B of the Project Specifications

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 10396:2003:	Implementing Preferential Construction Procurement Policies using Targeted Procurement Procedures
SANS 1914-1 to 6 (2002):	Targeted Construction Procurement
SANS 1921-1 (2004):	Construction and Management Requirements for Works Contracts Part 1: General Engineering and Construction Works and where accommodation of traffic is involved:
SANS 1921-2 (2004):	Construction and Management Requirements for Works Contracts; Part 2: Accommodation of Traffic on Public Roads Occupied by the Contractor.
SANS 10298 (2004):	Indirect small to medium-sized gas chlorination systems for the disinfection of water.
SANS 10142 (2020)	The Wiring of Premises

Other documents:

The latest edition of "Standards and Guidelines" from the National Home Builders Registration Council.

Model Preamble for Trades from the Association of SA Quantity Surveyors

General Conditions of Contract 2015 (third edition, 2015) Obtainable from the SA Association of Consulting Engineers

The Occupational Health and Safety Act (Act 85 of 1993)

C3.2 PROJECT SPECIFICATIONS**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 Gives variations and additions to standardized/particular specifications that are applicable to the civil mechanical and electrical work in the Contract.

Should any requirement of the project specification conflict with any requirement of the standardized or particular specifications, the requirement of the project specification shall prevail.

All specifications shall be read together. Reference to any clause may be done in the Schedule of Quantities, or may not be done, that is applicable to a pay item. However, this does not imply that it is the only applicable clause, and the Tenderer shall study the standardized specifications to ensure that he understands the extent of the work required.

Should any requirement of the Schedule of Quantities or drawings conflict with any requirement of the project specification listed, the requirement of the Schedule of Quantities and drawings shall prevail.

All instructions, variations, etc. placed on the site instruction book, and signed by the Employers Agent or the Employers Agent's Representative, in terms of Clause 5.9.2 of GCC 2015 will overrule all the above-mentioned documents.

PART A: GENERAL

PS.1 PROJECT DESCRIPTION

- ◆ The existing waste water treatment works at Margate consists of three (3) separate treatment trains with treatment train 3 actually two (2) treatment trains in parallel (treatment train 3(a) & 3(b)). None of these treatment trains are functional at the moment with only sedimentation taking place in most of the reactors and sedimentation tanks. This contract deals with primarily treatment train 1 and 2 of the Margate WWTW, Refurbishment of damaged pumpstations and bulk mains.

The contract entails the following:

- ◆ Replace the damaged Rising Main from Margate PS 1 to Margate PS 3A (160mm Ø uPVC Pipe) .
- ◆ Replace the damaged gravity reticulation feeding into Margate PS 1(160mm Ø uPVC Pipe).
- ◆ Rehabilitate and Upgrade 3 (No.) Sewer Pumpstations along bulk pipelines transporting raw sewerage to the Margate Wastewater Treatment Works.
- ◆ Rehabilitate the main outflow effluent main (375mm Ø Steel Pipe) from Margate WWTW to the outlet at Oslo Beach.
- ◆ To dredge/clean all reactors and sedimentation tanks and to refurbish all two (2) treatment trains in sequence so that a treatment train is capable of treating the influent waste water to the design capacity and limit.

PS.2 DESCRIPTION OF THE SITE AND ACCESS**PS.2.1 Location of Site**

The project is situated in the Ugu District Municipal, within Margate, adjacent to the R61 on the eastern side.

The co-ordinates of the centroid of the area of the scope of works:

Latitude 30°51'2.57"S;

Longitude 30°21'51.49"E.

PS.2.2 Access to Site

Access to site is per normal vehicle.

PS.2.3 Nature of the Ground and Subsoil Conditions

The Contractor will be expected to make his own assessment in this regard and to price the rates accordingly.

PS.2.4 Extent of Works

The extent of the works is:

The Margate WWTW currently consists of two old treatment trains with process design to the General Limit for effluent. Treatment train 3 that was added in $\pm$ 2010 was designed as some sort of hybrid aeration tank support process. The final process design aim of treatment train 3 is not very clear with the little "As Built" information available.

Due to various problems there is not a recent record of inflow and organic loading data available. Analysing the process design treatment capacity of all three (actually 4) treatment trains (treatment train 3 as a fully extended aeration activated sludge plant) the current treatment capacity available is $\pm$ 7 M ℓ /day AADDWF with an incoming COD concentration of 650 mg/ ℓ and nitrogen concentration of 70 mg/ ℓ .

None of these treatment trains are currently fully operational as mentioned. The flow to the treatment plant varies with holiday maker's influx and a compound peak factor of 1.32 was applied to the inflow for making provision of groundwater ingress and the holiday seasons.

Input from the plant operational staff was very useful.

Refurbishment and Process Optimization Requirements

The following items need refurbishment/replacement:

- **Treatment Train 1 - Old Works (4 x 22 kW on aeration basin)**
 - ◆ Flow measuring equipment and fixing of corroded concrete
 - ◆ Emptying and cleaning of aeration basin
 - ◆ Removal of aerator turbine from floor and removing 4 aerators and motors
 - ◆ Repair concrete structure where applicable
 - ◆ Repair and re-arrange aerator pocket mount positions
 - ◆ Repair/replace/modify automatic control outflow weir for oxygen level control
 - ◆ Supply and install complete 4 aerators with motors - *Investigate further the use of a dual speed electrical motor for an aerator with the aim of energy cost saving in future*
 - ◆ Add draft tubes under aerators for improved mixing and better nitrification
 - ◆ Repair/replace corroded pipework
 - ◆ Empty and clean sedimentation tanks
 - ◆ Remove rotating half bridge with corroded internal baffle chamber and replace with half bridge manufactured from 3CR12 or stainless steel
 - ◆ Remove outer canal baffle plate and V-notch weir and replace with stainless steel plates
 - ◆ Repair/replace scum draw off assembly
 - ◆ Refurbish/replace sludge re-circulation pumps
 - ◆ Install new oxygen probe with transmitting and monitoring equipment with automatic aeration control
 - ◆ New outlet weir control
 - ◆ Repair/replace old corroded pipes where required

➤ **Treatment Train 2 - New Works (3 x 22 kW on aeration basin)**

- ◆ Same as for treatment train 1 but only 3 aerators

Margate Pumpstation 1

At present, the pumpstation transfers sewage approximately 1900m to the Margate Pumpstation 3A, using Gorman Rupp VS4, self-priming pumps (1x duty and 1 standby), although only one of the pumps is currently in use. Recently the MCC burnt down due to an electrical shortage by rodents, therefore a temporary MCC is in use. No backup power is available. Telemetry is available. Poor stormwater control around the pumpstation causes flooding during heavy rains. Vandalism is frequent occurrence.

Requirements:

- Replacement/rehabilitation of pumps
- Backup Generator
- New Motor Control Centre (MCC)
- New Elevated Room for MCC and Generator
- All new pipework.
- Fencing, Cameras and Lighting for security
- Repairing/replacement of security doors, vents, windows, etc.
- Structural repairs to the building.
- Stormwater control around the pumpstation building.

Margate Pumpstation 3A

At present, the pumpstation transfers sewage approximately 1100m to the Margate Pumpstation 4A, using 75kw Hidrostal pumps (1x duty, 1 x duty assist and 1 standby), although only one of the pumps is currently in use. No backup power is available. Telemetry is available. Poor stormwater control around the pumpstation causes flooding during heavy rains. Leakage from the wet well to the dry well during heavy rains. Vandalism is frequent occurrence.

Requirements:

- Replacement/rehabilitation of pumps (Centrifugal, Hydro or vertical pumps)
- New base plates
- Electric hoist
- Backup Generator
- New Motor Control Centre (MCC)
- New Elevated Room for MCC and Generator above floodline.

- All new pipework
- Fencing, Cameras and Lighting for security
- Repairing/replacement of security doors, vents, windows, etc.
- Structural repairs to the building.
- Stormwater control around the pumpstation building.
- Increased capacity of sump.
- Valve overhaul.
- Sump screen or installed mercerator
- Water proofing.

Margate Pumpstation 4A

At present, the pumpstation transfers sewage approximately 130m to the Margate WWTW Head of Works, using 90kw Hidrostral immersible pumps (1x duty and 1 standby), although only one of the pumps is currently in use. Backup power is available, but generator needs an overhaul. Telemetry is available. Poor stormwater control around the pumpstation causes flooding during heavy rains. Leakage from the wet well to the dry well during heavy rains. Vandalism is frequent occurrence.

Requirements:

- Replacement/rehabilitation of pumps
- New base plates
- Electric hoist
- Backup Generator refurbishment
- New Motor Control Centre (MCC)
- New Elevated Room for MCC and Generator above floodline.
- All new pipework
- Cameras and Lighting for security
- Repairing/replacement of security doors, vents, windows, etc.
- Structural repairs to the building.
- Stormwater control around the pumpstation building.
- Valve overhaul.
- Water proofing.

Bulk Outflow Pipeline -Effluent Main

The existing bulk outflow pipeline is more than 15 years old and has exceeded its serviceable design life. Frequent occurrences of breakages along the line and the damages due to the recent floods result in effluent spillages into nearby watercourses and due to inefficiencies of treatment at the WWTW, often the effluent being carried in this pipe does not meet the required environmental standards. The outflow effluent main carries treated effluent from the Margate WWTW to an Outfall at Oslo Beach. The current pipe is a 375mmØ steel pipe, approximately 2000m long, to be replaced.

At full flow and $A = 0.159 \text{ m}^2$, $Q = 0.2356 \text{ m}^3/\text{s}$ $V = 1.5 \text{ m/s}$.

The length of this pipeline to the sea = $\pm 1500 \text{ m}$, $\Delta H = 45 \text{ m}$ giving the grade as 1:44 or 0.0227. Canal flow in the pipe (Manning) with $d/D = 0.92$ gives $Q_d/D=0.92 = 0.284 \text{ m}^3/\text{s}$.

Rising Main Details (Margate PS 1 to Margate PS 3A)

Pipe Diameter: 160mm

Pipe Material: uPVC

Pipe Length: 2000m

$Q_{\text{design}} = 0.007 \text{ m}^3/\text{s}$

$Q_{\text{pipe capacity}} = 0.020 \text{ m}^3/\text{s}$

$V = 1.5 \text{ m/s}$

$H = 9.008 \text{ m}$

Gravity Reticulation Details (to Margate PS 1)

Pipe Diameter: 160mm

Pipe Material: uPVC

Pipe Length: 1500m

$Q_{\text{design}} = 0.011 \text{ m}^3/\text{s}$

$Q_{\text{pipe capacity}} = 0.030 \text{ m}^3/\text{s}$

Summary of Sewer Infrastructure required (Pipelines and Pumpstations)

In summary the following infrastructure/ additions to the existing sewer infrastructure is required to enable the proposed development to proceed:

- Replacing approximately 2.000km, 375mm Ø Steel Bulk Outflow Effluent Main
- Rehabilitation and upgrade of Margate Sewer Pumpstation 1
- Rehabilitation and upgrade of Margate Sewer Pumpstation 3A
- Rehabilitation and upgrade of Margate Sewer Pumpstation 4A
- Replacing approximately 2.000km, 160mm Ø uPVC Bulk Rising Main from PS1 to PS3A.
- Replacing approximately 1.500km, 160mm Ø uPVC Reticulation Pipelines to PS1.

PS.3 CONSTRUCTION AND MANAGEMENT REQUIREMENTS**PS.3.1 General**

The Contractor is referred to SANS 1921: 2004 parts 1, 2 and 3: Construction and Management Requirements for Works Contracts. 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.3.2 Labour Intensive Competencies of Supervisory and Management Staff

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

Table 1: Skills programme for supervisory and management staff

Personnel	NQF level	Unit standard titles	Skills programme description
Team leader / supervisor	2	Apply Labour Intensive Construction Systems and Techniques to Work Activities	This unit standard must be completed, and any one of these 3 unit standards
		Use Labour Intensive Construction Methods to Construct and Maintain Roads and Stormwater Drainage	
		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour Intensive Construction Methods to Construct, Repair and Maintain Structures	
Foreman/ supervisor	4	Implement labour Intensive Construction Systems and Techniques	This unit standard must be completed, and any one of these 3 unit standards
		Use Labour Intensive Construction Methods to Construct and Maintain Roads and Stormwater Drainage	
		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour Intensive Construction Methods to Construct, Repair and Maintain Structures	
Site Agent / Manager (i.e. the contractor's most senior representative that is resident on the site)	5	Manage Labour Intensive Construction Processes	Skills Program against this single unit standard

The managing principal of the contractor, namely, a sole proprietor, the senior partner, the managing director or managing member of a close corporation, as relevant, having a contractor grading designation of 1CE, 2CE, 3CE and 4CE shall have personally completed, or for the period 1 April 2004 to 30 June 2006 be registered on a skills programme for the NQF level 2. All other site supervisory staff in the employ of such contractors must have completed, or for the period 1 April 2004 to 30 June 2006 be registered on a skills programme for, the NQF level 2 unit standards or NQF level 4 unit standards.

PS.3.3 Employment of Labour

It is the intention that this Contract should make the maximum possible use of the labour force which is at present underemployed.

To this end it will be expected of the Contractor to employ and train labour on this Contract.

The Contractor shall fill in the forms relating to Key Personnel and state how many key personnel he intends to employ in the various categories. The numbers stated in the above-mentioned form will be strictly controlled during the contract period and any increase in numbers shall be subject to the approval of the Engineer.

It is a condition of contract that the data sheets detailing the employment of human resources, expenditure and employment of SMMES as detailed in the tables below be submitted together with the monthly certificate timorously to the Engineer by the 30th of each month.

The definition of youth being determined by age up to and including 35 years.

The unit of measurement is person days being the total number of persons in that category multiplied by the number of days worked by each person respectively.

Labour intensive construction will be used to implement the Works and will include all of the following operations: -

- (a) All trenching and backfilling of trenches. Excavation in hard, unpickable material and rock will be done by machine and blasting respectively;
- (b) All laying and bedding of pipework. The contractor is required to train local labour in the laying of these pipes;
- (c) Bedding, including the short haul by wheelbarrow at a maximum distance of **100m**, of imported stockpiles placed alongside the trench;
- (d) Construction of manholes, valve chambers, gabion basket filling, erosion protection measures etc.;
- (e) Manufacturing of pipe route markers on site; and
- (f) Steel fixing, shutter hand work and minor concrete works.

Plant may be used to deliver bedding to the trench at **100m** intervals from where labour must be used to load, haul and off-load the material using wheelbarrows. **The use of a machinery for this activity will not be permitted.**

All work to be executed by labour intensive methods will be demarcated as **(LI)** in the bill of quantities. Any work so designated or specified in this specification as being done labour intensively but which is not executed by labour, notwithstanding any payment made to the labour, will not be paid for.

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

The data sheets must be submitted monthly irrespective of whether or not a payment certificate is submitted in terms of the latest cash flow.

P.S.3.3.1**Payment for the Labour-Intensive Component of the Works:**

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

P.S.3.3.2 Applicable Labour Law

The Ministerial Determination 4: Expanded Public Works Programmes, issued in terms of the Basic Conditions of Employment act of 1997 by the Minister of Labour in Government Notice NR347 of 4 May 2012, as reproduced below, shall apply to works described in the scope of work as being labour intensive and which are undertaken by unskilled or semi-skilled workers. An EPWP contract shall be signed between the contractor and the EPWP participant using the template appended. The contracts shall expire on earlier of (i) 31 March, (ii) at the end of the project; or (iii) completion of the works allocated.

P.S.3.3.3 Introduction

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

In this document –

- (a) “*department*” means any department of the State, implementing agent or contractor;
- (b) “*employer*” means any department, implementing agency or contractor that hires workers to work in elementary occupations on an EPWP;
- (c) “*worker*” means any person working in an elementary occupation on a EPWP;
- (d) “*elementary occupation*” means any occupation involving unskilled or semi- skilled work;
- (e) “*management*” means any person employed by a department or implementing agency to administer or execute an EPWP;
- (f) “*task*” means a fixed quantity of work;
- (g) “*task-based work*” means work in which a worker is paid a fixed rate for performing a task;
- (h) “*task-rated worker*” means a worker paid on the basis of the number of tasks completed;
- (i) “*time-rated worker*” means a worker paid on the basis of the length of time worked.

P.S.3.3.4 Terms of Work

- (a) Workers on an EPWP are employed on a temporary basis or contract basis.

P.S.3.3.5 Normal Hours of Work

- (a) An employer may not set tasks or hours of work that require a worker to work–
 - a. more than forty hours in any week
 - b. on more than five days in any week; and
 - c. for more than eight hours on any day.
- (b) An employer and worker may agree that a worker will work four days per week. The worker may then work up to ten hours per day.
- (c) A task-rated worker may not work more than a total of 55 hours in any week to complete the tasks allocated (based on a 40-hour week) to that worker.

P.S.3.3.6 Meal Breaks

- (a) A worker may not work for more than five hours without taking a meal break of at least thirty minutes duration.
- (b) An employer and worker may agree on longer meal breaks.
- (c) A worker may not work during a meal break. However, an employer may require a worker to perform duties during a meal break if those duties cannot be left unattended and cannot be performed by another worker. An employer must take reasonable steps to ensure that a worker is relieved of his or her duties during the meal break.
- (d) A worker is not entitled to payment for the period of a meal break. However, a worker who is paid on the basis of time worked must be paid if the worker is required to work or to be available for work during the meal break.

P.S.3.3.6 Special Conditions for Security Guards

- (a) A security guard may work up to 55 hours per week and up to eleven hours per day.
- (b) A security guard who works more than ten hours per day must have a meal break of at least one hour or two breaks of at least 30 minutes each.

P.S.3.3.7 Daily Rest Period

- (a) Every worker is entitled to a daily rest period of at least twelve consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

P.S.3.3.8 Weekly Rest Period

- (a) Every worker must have two days off every week. A worker may only work on their day off to perform work which must be done without delay and cannot be performed by workers during their ordinary hours of work ("emergency work").

P.S.3.3.9 Sick Leave

- (a) Only workers who work for more than 24 hours have the right to claim sick pay in terms of this clause
- (b) A worker who is unable to work on account of illness or injury is entitled to claim one day's paid sick leave for every full month that the worker has worked in terms of a contract.
- (c) A worker may accumulate a maximum of twelve days' sick leave in a year
- (d) Accumulated sick leave may not be transferred from one contract to another contract.
- (e) An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.
- (f) An employer must pay a time-rated worker the worker's daily rate of pay for a day's sick leave.
- (g) An employer must pay a worker sick pay on the worker's usual payday.
- (h) Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is –
 - (i) absent from work for more than two consecutive days; or
 - (j) absent from work on more than two occasions in any eight-week period.
- (k) A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorised to issue medical certificates indicating the duration and reason for incapacity.
- (l) A worker is not entitled to paid sick leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational Injuries and Diseases Act.

P.S.3.3.10 Maternity Leave

- (a) A worker may take up to four consecutive months' unpaid maternity leave.
- (b) A worker is not entitled to any payment or employment-related benefits during maternity leave.
- (c) A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.
- (d) A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.
- (e) A worker may begin maternity leave –
- (f) four weeks before the expected date of birth; or
- (g) on an earlier date –
 - a. if a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or
 - b. if agreed to between employer and worker; or
 - c. on a later date, if a medical practitioner, midwife or certified nurse has certified that the worker is able to continue to work without endangering her health.
- (h) A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.

P.S.3.3.11 Family responsibility leave

Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances -

- (a) when the employee's child is born;
- (b) when the employee's child is sick;
- (c) in the event of a death of –
- (d) the employee's spouse or life partner;
- (e) the employee's parent, adoptive parent, grandparent, child, adopted child, grandchild or sibling.
- (f)

P.S.3.3.12 Statement of Conditions

An employer must give a worker a statement containing the following details at the start of employment –

- (a) the employer's name and address and the name of the EPWP;
- (b) the tasks or job that the worker is to perform; and
- (c) the period for which the worker is hired or, if this is not certain, the expected duration of the contract;
- (d) the worker's rate of pay and how this is to be calculated;
- (e) the training that the worker will receive during the EPWP.
- (f) An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement.
- (g) An employer must supply each worker with a copy of these conditions of employment.

P.S.3.3.13 Keeping Records

Every employer must keep a written record of at least the following –

- (a) the worker's name and position;
- (b) Certified ID copies of all locally employed labour
- (c) Signed Contracts between the employer and the EPWP Participants
- (d) Attendance Registers for the EPWP Participants
- (e) Monthly Reporting Template as per EPWP requirements
- (f) in the case of a task-rated worker, the number of tasks completed by the worker;
- (g) in the case of a time-rated worker, the time worked by the worker;
- (h) Proof of payments made to each worker.
- (i) The employer must keep this record for a period of at least three years after the completion of the EPWP.

P.S.3.3.14 Payment

- (a) An employer must pay all wages at least monthly in cash or by cheque or into a bank account.
- (b) A worker may not be paid less than the minimum EPWP wage rate of R150.00 per day or per task. This will be adjusted annually on the 1st of November in-line with inflation (available CPI as provided by Stats SA six (6) weeks before implementation).
- (c) A task-rated worker will only be paid for tasks that have been completed.
- (d) An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer.
- (e) A time-rated worker will be paid at the end of each month.
- (f) Payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.
- (g) Payment in cash or by cheque must take place –
 - a. at the workplace or at a place agreed to by the worker;
 - b. during the worker's working hours or within fifteen minutes of the start or finish of work;
 - c. in a sealed envelope which becomes the property of the worker.
- (h) An employer must give a worker the following information in writing –
 - a. the period for which payment is made;
 - b. the numbers of tasks completed, or hours worked;
 - c. the worker's earnings;
 - d. any money deducted from the payment;

- e. the actual amount paid to the worker.
- (i) If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it.
- (j) If a worker's employment is terminated, the employer must pay all monies owing to that worker within one month of the termination of employment.

P.S.3.3.15 Deductions

- (a) An employer may not deduct money from a worker's payment unless the deduction is required in terms of a law.
- (b) An employer must deduct and pay to the SA Revenue Services any income tax that the worker is required to pay.
- (c) An employer who deducts money from a worker's pay for payment to another person must pay the money to that person within the time period and other requirements specified in the agreement law, court order or arbitration award concerned.
- (d) An employer may not require or allow a worker to –
 - a. repay any payment except an overpayment previously made by the employer by mistake;
 - b. state that the worker received a greater amount of money than the employer actually paid to the worker; or
 - c. pay the employer or any other person for having been employed.

P.S.3.3.16 Health and Safety

- (a) Employers must take all reasonable steps to ensure that the working environment is healthy and safe.
- (b) A worker must –
 - a. work in a way that does not endanger his/her health and safety or that of any other person;
 - b. obey any health and safety instruction;
 - c. obey all health and safety rules of the EPWP;
 - d. use any personal protective equipment or clothing issued by the employer;
 - e. report any accident, near-miss incident or dangerous behavior by another person to their employer or manager.

P.S.3.3.17 Compensation for Injuries and Diseases

- (a) It is the responsibility of the employers (other than a contractor) to arrange for all persons employed on an EPWP to be covered in terms of the Compensation for Occupational Injuries and Diseases Act, 130 of 1993.
- (b) A worker must report any work-related injury or occupational disease to their employer or manager.
- (c) The employer must report the accident or disease to the Compensation Commissioner.
- (d) An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

P.S.3.3.18 Termination

- (a) The employer may terminate the employment of a worker for good cause after following a fair procedure.
- (b) A worker will not receive severance pay on termination.
- (c) A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.
- (d) A worker who is absent for more than three consecutive days without informing the employer of an intention to return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available.
- (e) A worker who does not attend required training events, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available.

P.S.3.3.19 Certificate of Service

On termination of employment, a worker is entitled to a certificate stating –

- (a) the worker's full name;
- (b) the name and address of the employer;
- (c) the EPWP on which the worker worked;
- (d) the work performed by the worker;
- (e) any training received by the worker as part of the EPWP;
- (f) the period for which the worker worked on the EPWP;
- (g) any other information agreed on by the employer and worker.

P.S.3.3.20 Contractor's default in payment to Labourers and Employees

- (a) Any dispute between the Contractor and labourers, regarding delayed payment or default in payment of fair wages, if not resolved immediately may compel the Employer to intervene.
- (b) The Employer may, upon the Contractor defaulting payment, pay the moneys due to the workers not honoured in time, out of any moneys due or which may become due to the Contractor under the Contract.

P.S.3.3.21 Provision of Hand tools

- (a) The Contractor shall provide his labour force with hand tools of adequate quality, sufficient in numbers and make the necessary provisions to maintain the tools in good and safe working conditions

P.S.3.3.22 Reporting

The Contractor shall submit monthly returns/reports as specified below:

- (a) Signed Master rolls/pay sheets of temporary workers and permanent staff detailing the number, category, gender, rate of pay and daily attendance.
 - (b) Certified ID copies of all locally employed labour
 - (c) Signed Contracts between the employer and the EPWP Participants
 - (d) Attendance Registers for the EPWP Participants
 - (e) Monthly Reporting Template as per EPWP requirements
 - (f) Plant utilization returns
- Progress report detailing production output compared to the programme of works

P.S.3.3.23 Labour-intensive works

Labour-intensive works comprise the activities such as those described in SANS 1921-5, Earthworks activities which are to be performed by hand, and its associated specification data. Such works shall be constructed using local workers who are temporarily employed in terms of this Scope of Work.

PS.3.4 Construction Programme**(a) Preliminary Programme**

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

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

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

(b) 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 of the General Conditions of Contract 2015.

Due to the importance of keeping treated water supply delivered to town on a continuous basis some of the construction actions shall be on a pre-determined time schedule for any disruption in the purification process.

NB: The construction program must take into account that the refurbishment process is a repetition of the same construction process and that the next step may not proceed before the previous action is completed.

A treatment train cannot be recommissioned before the refurbishment of the sedimentation/clarifier tank, associated filter(s), cleaning of the associated clear water sump and standby power is available at the centre scraper or half bridge is available.

A further time restriction is the ordering of goods by the contractor (civil or mechanical). Certain final measurements or design parameters can only be determined during the actual construction period.

PS.3.5 Drawings *(Read with SANS 1921 – 1: 2004 clauses 4.1.7; 4.1.11 and 4.1.12)*

The reduced drawings which form part of the tender documents shall be used for tendering purposes only.

The contractor shall be supplied with three complete paper copies of the construction drawings free of charge. The Contractor shall at his own expense produce there from all further paper prints required for the construction of the work.

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

Only written dimensions may be used. Dimensions are not to be scaled from drawings unless ordered by the Engineer. The Engineer will supply all figures / dimensions which are not shown on the drawings. The levels or dimensions given on the drawings are subject to confirmation on site.

There were no As Built drawings available for the WWTW from the client side. All dimensions on the drawings were surveyed and dimensions not picked up from this process were either assumed or roughly measured from outside of the structure. **With the refurbishment work in progress the contractor shall on a scheduled sequence supply dimensions of opened up areas to the representative of the client to forward it to the design engineer for updating and the issuing of variation orders when necessary.**

PS.3.6 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.3.7 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.3.8 Blasting

No blasting shall be carried out for the execution of the Works without the prior consent of the Engineer. This consent will not be given where in the opinion of the Engineer blasting may give rise to unnecessary risk of damage to surrounding property and other means of excavation are available to the Contractor. Where consent to blasting is given such consent shall in no way relieve the Contractor of any of his liabilities under the Contract.

No blasting will be permitted within 10 m of any structure, pipeline or service 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 structure, pipeline or service. The Engineer may then ask for vibro-readings to be taken at no additional cost to the Employer. No blasting is to be carried out in Eskom, Telkom or other servitudes or way leaves unless the relevant authorities have been advised in writing three weeks prior to blasting. Where blasting is carried out the Contractor shall arrange for a representative of the relevant authority to be present prior to and during the blast.

The Contractor shall conform to all Government regulations in regard to blasting, handling and storage of explosives.

PS.3.9 Spoil Sites *(Read with SANS 1921 - 1 : 2004 clause 4.10)*

The successful tenderer must arrange with the Ugu District Municipality for a spoil site for the redundant filter sand and all concrete and steel rubble generated during the construction period. The tendered rate for spoil material must allow for free-haul up to 2 km.

PS.3.10 Testing *(Read with SANS 1921 – 1 : 2004 clause 4.11)***(a) Process control**

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.

(b) 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.3.11 Site Establishment *(Read with SANS 1921 - 1 : 2004 clause 4.14)*

(a) Water and Electricity

The Contractor is to make his own arrangements in this regard and should note that the Employer shall not be held responsible for any shortages of either water or power due to unforeseen circumstances.

Water will be made available for hydraulic testing purposes only. All other water required for construction purposes is to be sourced by the Contractor and is to be allowed for in his rates.

(b) Location of Site Office

A suitable site will be indicated at the Site Inspection. The contractor will need to allow for the fencing of the site.

Watchmen only may be housed on site.

The contractor is to provide adequate sanitary and waste facilities for his staff and is to ensure that the camp is kept clean and neat at all times. No littering is to take place at either the camp or on the site.

The site is to be left in a neat, landscaped condition without any improvements on completion of the contract and final retention will not be released until such time as this condition has been complied with.

(c) Telephone

The contractor shall make his own arrangements in this regard. Cellular phone coverage is available in the area.

PS.3.12 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 survey 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.3.13 Existing Services (*Read with SANS 1921 - 1: 2004 clause 4.17*)

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

No work may proceed on road crossings under the provincial main roads until the necessary approvals are in place as confirmed by the Engineer. All work within the road reserve shall comply with the specifications of the Provincial Department of Transport as will be issued to the Contractor by the Engineer.

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.

Prior to commencing construction activities in a particular area, the Contractor shall also diligently enquire of local landowners as to whether there are any other known services which have not been shown on the drawings but which may be affected by the construction activities in that area, and any such services shall be brought to the attention of the Engineer immediately. The Contractor shall take note of the requirements of clause 1202 of the standard specifications with regard to services.

PS.3.14 Health and Safety (*Read with SANS 1921 - 1: 2004 clause 4.18*)

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 2003 issued on 18 July 2003 by the Department of Labour.

For the purpose of this contract the Contractor is required to confirm his status as mandatory and employer in his own right for the execution of the contract by entering into an agreement with the Employer in terms of the Occupational Health and Safety Act in the form as included in section C1.2.2

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.

The Contractor's failure to comply will also be recorded on the Ugu District Municipal data base and will affect the award of adjudication points to the Contractor on future work tendered for.

PS.3.15 Management of the Environment *(Read with SANS 1921 - 1 : 2004 clause 4.19)*

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

(a) Natural Vegetation

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.

(c) Environmental Management Plan

In addition to the above, all requirements of the Environmental Management Plan (EMP) as detailed in the Particular Specifications, will be adhered to.

Failure to adhere to the EMP in all respects will be recorded on the Ugu District Municipal database and will affect the award of adjudication points to the Contractor on future work tendered for.

PS.3.16 Abnormal Climatic Conditions**Critical Path Method**

In terms of GCC 2015, Clause 5.12.2.2, 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/her tendered rates, prices and programme, are listed in Table 3.16 below. Only the number of days lost as a result of adverse weather conditions, exceeding the number of days listed in Table 3.16, will qualify for consideration of extension of time.

Table 3.16. EXPECTED NUMBER OF WORKING DAYS LOST PER MONTH DUE TO NORMAL RAINFALL

Month	Expected number of working days lost as result of normal rainfall
January	*4
February	3
March	4
April	2
May	2
June	1
July	1
August	2
OCTOBER	2
October	3
November	3
December	*3
TOTAL (Days)	30

Note: Rainfall records above relate to Rainfall Station № 211 437 – Scottburgh.

(* The number of working days lost for December and January allows for the builders' holidays from December to the end of January.)

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 because 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 3.16, which could result in a negative figure for certain months. The total extension of time because 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.

The Contractor shall provide a rain gauge installation and ensure that it is tamper-proof. Costs thereof shall be deemed to be included in tendered rates.

PS.3.17 Drawings of Record

Any information in the possession of the Contractor, which is necessary for the Engineer's Representative to complete his "drawings of record", must be submitted to the Engineer's Representative before a final payment certificate and a certificate of completion will be issued.

Included in the information to be provided by the contractor shall be the co-ordinated position of all above ground visible features including.

PS. 4 PROJECT REQUIREMENTS**PS4.1 SITE CLEARANCE, EXCAVATION AND FREE-HAUL**

Topsoil and other removed material shall be placed within the site boundaries, at a place indicated by the Local Authority in writing. In the case where the Local Authority requires disposing of material further away from the site, the Employer's approval shall first be obtained, and Local Authority shall be consulted and approval in writing obtained to use the designated dumping place. The same applies for borrow areas outside the site boundaries. Normal regulations regarding safety, municipal by-laws, contamination of water sources, erosion, siltation etc. shall apply.

The free-haul distance shall be the entire site of works, for each project.

The contractor shall not incur any overhaul or "extra over" expenses without the written approval of the Engineer.

The overhaul distance shall be defined as the truck-haul distance measured to the nearest 0,5 km from the end of the free-haul to the disposal / borrow pit area, by the shortest practical route and shall be measured in one direction only.

No additional payment will be made for provision of access to the sites.

PS 4.2 CUT AND FILL FOR BUILDING PLATFORMS

Buildings shall be constructed completely in cut, with a minimum underfloor backfill. Should the contractor wish to construct on fill, he shall allow at his own cost, for longer columns and higher foundation walls to allow for **founding on in-situ material**. Access and ease of access into the building for the intended use shall remain unaltered. The Contractor shall arrange independent compaction tests, before any building is taking place, at his own cost. Building work shall be removed if there is any doubt whatsoever regarding the compaction. At least 3 evenly distributed places per site shall be tested, once off, after completion of the platform or infill. Water for compaction shall be provided by the Contractor at his own cost.

PS 4.3 COMPACTION OF UNDER FLOOR FILL

All topsoil, unsuitable material and vegetation shall be removed from the building area. Suitable non-cohesive, granular backfill material shall be compacted in thin, even layers of thickness relevant to the method/machinery used, at OMC to a minimum of 95 % of Mod. AASHTO maximum density. The contractor shall only import material if absolutely necessary. He shall obtain approval from the borrow pit owner in writing before using it or obtain mining rights where applicable. Water for compaction, shall be supplied by the Contractor, at his own cost.

PS 4.4 EXISTING SERVICES

The Contractor shall contact the Engineer immediately if he discovers existing services that are in the way of the works, so that it can be avoided if at all possible. If existing services are damaged, the Contractor shall repair it as a matter of urgency at the indicated rate, even if it costs significantly more. He will not receive additional compensation in such case.

PS 4.5 WATER SUPPLY PIPE

Only SABS approved HDPE and uPVC pipe to be used. Trench depth to be determined to allow for bedding where required and 1800 mm cover for bulk. Grading of the trench shall be as such that the pipe will have no local high points between air valves/outlets, in other words, must rise continuously from the lowest points to the air valves/outlets. The Contractor shall use a dumpy level to verify this and to locate the air valves. The same applies for scour valves but obviously the other way around. The trench "pegging" cost shall be included under the excavation cost. Long sections may be provided by the Engineer or Employer as a guide only. Trenching, bedding and selected fill as per SABS 1200 DB and LB. The trench width for pipe diameters of 300 mm and less shall be minimum pipe diameter plus 500mm (250 mm side allowance) to allow adequate working space for proper jointing and laying of pipe, but shall not be wider than pipe diameter plus 600 mm

PS 4.6 CONCRETE AND FLOORS

Water for building purposes and for the Contractor's use, shall be supplied by the Contractor, at his own cost.

Cement shall be OPC and shall conform to SABS 471. A blended mix with up to 25% PFA shall only be used following the written approval of the Engineer. Cement used shall not be older than 3 months for reinforced concrete works and older than 6 months for mass concrete. The slump of concrete mixes shall be 30- 80 mm. Curing shall take place for at least 7 days or as specified. Concrete shall be adequately compacted/vibrated but separation of material must be avoided. For structural concrete, refer to the detailed specifications on the plans regarding slump, curing, removal of formwork etc.

Floors and walls shall be constructed as such that water will not reach or stand in the passages/walkways or anywhere on the floor. Water shall also not reach or stand against any of the inside walls. Where openings are to be made to drain water, it shall be as such that it will not block, but at the same time it shall be rodent proof.

Keyed construction joints shall be placed as such that it will not be underneath walls. Where it has to cross walls perpendicularly, construction joints shall also be provided in the walls. Keyed construction joints shall be made around supports, to join construction joints in the floors.

Foundations

All foundations for buildings shall be minimum 300 mm deep and 500 mm wide regardless of detail provided on plans.

Light reinforcement shall be placed in foundations comprising three Y12 rods 75 mm from the trench bottom and 100 mm from the sides with the third rod in the bottom middle. The main reinforcement shall be held firmly in place by 75 mm concrete spacers attached to the rods with binding wire. R8 distribution steel, crossing each outer main steel member by 30 mm, thus 360 mm long for a 500-wide foundation, shall be tied to the main steel at 500 mm intervals.

Minimum overlap shall be 600mm. Hooks shall be provided at corners and intersections with walls, with minimum hook length 600 mm. The Engineer shall be consulted for further detail. Work shall not be accepted where the Engineer has not approved the reinforcement prior to concreting.

Wood floated finish

The surface shall only be wood floated sufficiently to produce a uniform surface free from screed or towel marks and shall conform with SABS 1200 G.

Steel-floated finish

The moisture film shall be allowed to harden sufficiently to prevent laitance from being worked to the surface. Where steel floating with a non-slip surface is specified, the surface shall still be smooth after making it non-slip and shall not be abrasive at all. Under no circumstances may a cement slush be used during the floating process.

Casting of concrete

No concrete shall be cast without the prior inspection of preparation work by the Engineer (except for thrust blocks)

PS 4.9 BLOCK AND BRICK WORK

The strength of blocks shall be not less than 3,5 MPa for hollow units and 7 MPa for solid units. Only SABS approved blocks shall be allowed.

Blockwork shall comply with the standards as set out in the “Standards and Guidelines” manual of the NHBRC. Stretcher bond with 10-15 mm final bed joint thickness and 5 to 20 mm vertical joint thickness shall be used. The mortar bedding shall be full in the case of hollow blocks for the foundation layers and DPC courses. Joints shall be finished flush. Hollow units to be filled with concrete around door frames. Where internal walls are jointed flush with outside walls, wall ties shall be used as per specification in the above-named manuals. Corners shall be constructed using the raking back (stepped) method and shall be fully bonded.

Light reinforcement shall be placed in the brick/blockwork over and above the normal brick force regardless of detail on plans. The reinforcement shall comprise R6 rods, overlapping minimum 300 mm and bend around corners with minimum hook length 300 mm. The reinforcement shall not cross expansion joints. Two rods shall be placed per layer, each 30 mm from the inside and outside face of the wall respectively, for three layers immediately above DPC and window/door level. Rods shall be provided with hooks at doors, expansion joints and openings. Full mortar cover shall be provided.

Controlled expansion joints in the walls, with concertina ties at 400 mm vertical spacing, shall be provided at maximum 8 m spacing regardless of detail provided on plans. The joints shall coincide with controlled expansion joint through the concrete roof.

The joints in the roof slabs shall comprise 1000 mm long Y12 rods in the center of the slab at 200 mm intervals, 500 mm into each slab. A 600 mm long elastic plastic pipe of good fit shall be fitted on one side and sealed at the end. The other end shall penetrate the adjoining slab by 100 mm. Work shall not be accepted where the Engineer has not approved the reinforcement prior to concreting. The joints shall be formed with 10 mm bitumen impregnated soft board and shall be sealed watertight both sides with an approved elastic sealant.

PS 4.11 PAINTWORK

The final colour shall be agreed upon between the contractor and the participants of the specific project. Refer to paint specifications on the plans

PS 4: 7 COMMISSIONING AND ACCEPTANCE

The Contractor shall be responsible to commission all equipment and put in readiness for use.

The hand over/acceptance of equipment shall be preceded by a forty-eight (48) hour trial run (where applicable) by the Contractor to enable him to prove to the Engineer that all equipment and plant as a whole perform to requirements.

Where after the equipment shall be run by the Contractor as directed by the Engineer for a further period of approx. five (5) days during which thorough inspection, testing, etc. of all equipment will take place to be evaluated for acceptance by the Engineer. The Contractor shall schedule this period such as to allow himself enough time to remedy, replace etc. unsatisfactory work, equipment etc. and still meet the final completion date.

Costs incurred by the Engineer for all unsuccessful acceptance tests will be borne by the Contractor.

When the Contractor has completed all work and the plant subsequently performs to the requirements, then the contractor shall supply all manuals and drawings as called for. Thereupon a certificate of commissioning will be issued, and a portion of the retention released. The guarantee period then commences.

PS 4:8 FINAL COMPLETION DATE

On final completion all work in terms of the contract shall be completed. A certificate of completion will be issued.

PS 4:9 MAINTENANCE OBLIGATIONS

The Contractor shall maintain all equipment provided in a good working order during the defect's liability period.

The defects liability period shall commence on the day following final completion.

The Employer reserves the right to undertake any emergency repair work during the defect's liability period without the prior consent of the Contractor. The Engineer has the right to decide whether an emergency exists and shall notify the Contractor accordingly. Should this emergency repair work be caused by poor materials, faulty workmanship or neglect on the part of the Contractor, the Employer may deduct the cost of the repairs from the outstanding retention money owing to the Contractor.

After the satisfactory completion of the guarantee period, the final certificate will be issued, and all retention money releases.

PS 5 ELECTRICAL & INSTRUMENTATION PROJECT SPECIFICATION**PS 5.1 GENERAL INFORMATION****PS 5.1.1 STANDARDS AND REGULATIONS****PS 5.1.1.1 GENERAL**

The Standard Specifications forming part of this tender document shall apply unless otherwise indicated in this section. The Project Specification shall take preference and precedence if any discrepancies exist or if there are any un-certainties. 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.

PS 5.1.1.2 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 Ugu District Municipality
- 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
- Ugu District WWTW General Standard and Particular Specifications for Electrical and Instrumentation Installations 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

PS 5.1.1.3 QUALITY CONTROL PROCEDURES

QCP's and associated documentation for all equipment specified in accordance with Ugu District Municipality WWTW Standards as applicable or to 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.

PS 5.1.1.4 OMISSIONS FROM TENDER DOCUMENT

The Tenderer shall determine whether any parts or pages have been omitted from the tender or whether any information is indistinct or illegible. If so, the Tenderer shall approach the Engineer for rectification or clarification before the tender closing date. No claims for revision of the tender price as a result of any omission or indistinct printing shall be considered after the tender closing date.

PS 5.1.1.5 ALTERNATIVE DESIGN OR EQUIPMENT

If the Tenderer is of the opinion that any equipment or parts are of inadequate size or capacity or have been omitted or if the Tenderer wishes to offer alternative materials or installation methods, this should be stated in a covering letter, complete with full details, design information and drawings.

In the absence of such a submission, it will be assumed that all required items have been included in the tender price, and that the tender is completely in accordance with the specification in terms of quality, quantity and performance.

PS 5.1.1.6 SAFETY

The contractor is responsible for active and controlled compliance with the specific requirements pertaining to establishing and formalizing a compliant safety plan as envisaged in the OHS Act.

Designated responsible individuals will be identified to the client and his representatives before work commences.

A copy of the contractor's approved safety plan shall similarly be made available to the client before any work commences.

PS 5.1.1.7 SETTING OUT OF WORKS

The contractor shall be responsible for marking out and setting out of all equipment and plant.

The positions of items of electrical, instrumentation and mechanical equipment and plant indicated on the drawings are to be taken as approximate. The exact position for fixing shall be obtained by site measurements. The Engineer on site shall determine final luminaire positions and mounting heights of electrical installation items.

In case of doubt, decisions shall be obtained from the Engineer, his representative or agent.

PS 5.1.1.7 INSTALLATION OF EQUIPMENT

The contractor shall be responsible for the installation of all electrical, instrumentation and mechanical equipment supplied by him under this contract.

In addition, the electrical contractor shall be responsible for the care and maintenance of all electrical equipment after erection is completed until the first delivery of the specific section of the works.

He shall ensure that the proper enclosure of all equipment is maintained at all times, that access doors and covers are opened only when necessary to work on the equipment and replaced afterwards, that the paint finish on all items is effectively protected and that all unused cable and conduit entries are effectively sealed.

PS 5.1.1.8 TESTING OF INSTALLATION

All tests of insulation resistance, earth continuity, earth loop impedance, and earth electrode resistance shall be made in accordance with the requirements of the Electrical Contracting, Board of South Africa in accordance with the Occupational Health and Safety Act's Electrical Installation Regulations as amended to date and a certificate of compliance by an accredited person, shall be issued.

The electrical contractor shall provide all test instruments and labour for the proper and adequate testing of the installation. The following is to be followed :

- Testing, commissioning, handing over of the complete electrical installation
- Coordination with the Supply Authority for all required tests, shutdowns, etc.
- Testing of all new installations in accordance with SANS 10142 and the issue of a Certificate of Compliance

PS 5.1.1.9 EXISTING SERVICES

The supply and installation of the electrical and instrumentation installation may result in certain work to be executed close to existing electrical or other services and networks.

The electrical contractor shall accurately determine all existing service routes and positions where required, and all excavation and exposure of existing trenches and cables shall be done by hand. The electrical contractor shall exercise extreme care and caution in these works.

The electrical contractor shall be responsible for any damage to existing services, and the contractor at his own cost shall make any such damage good, to the satisfaction of the Employer and the Engineer.

The contractor shall, before commencement of any works, obtain from the Engineer clear indications and plans, complete with dimensions, indicating routes and positions of all existing services.

The electrical and instrumentation contractor shall allow for all of the above requirements.

PS 5.1.1.10 THE SITE

The project is situated in the Ugu District Municipal, within Margate, adjacent to the R61 on the eastern side..

PS 5.1.1.10.1 Point of Delivery

The point of delivery shall be taken as the site and the contractor shall arrange for storage in a safe place on the site. In every case the contractor shall prove to the Engineer that the place and method of storage satisfies the prerequisites of the OEM supplier and the relevant insurance company and their requirements.

All the material and equipment being supplied and installed in terms of this Contract shall be suitable for continuous operation at the total specified output or capacity under the following conditions:

PS 5.1.1.10.2 Climatic Conditions¹

ITEM	DESCRIPTION
Altitude:	Ca 0m to 59m above sea level
Ambient temperatures:	Typical maximum: 45 °C Average maximum: 28 °C
	Typical minimum: -5 °C Average Minimum: 3 °C
Relative humidity:	Typical maximum: 95%, Typical minimum: 5%
Atmosphere:	Very humid
Lightning:	Severe to Extreme Lightning Risk Area.
Thermal resistivity of soil:	May reach 3,0 K.m/W
Average soil temperature:	25 °C Typical
Corrosion conditions	Medium to Very Heavy
Pollution conditions	Three

PS 5.2 SCOPE OF WORK**PS 5.2.1 ELECTRICAL, INSTRUMENTATION , MECHANICAL & ANCILLIARY WORK**

The electrical, instrumentation and ancillary mechanical and other associated work installation comprises and includes the design, manufacture, supply, delivery, installation, testing, commissioning, guarantee and maintenance of the following:

PS 9.2.1.1 WWTW - INLET WORKS & AERATORS TT1

- Disconnect and remove the existing MCCs for the TT1 existing inlet works and aerators
- Disconenct and remove the cabling etc for the existing TT1 aerators and asociated equipment, instruments , sensors etc
- Disconnect and remove the existing electrics, lights , power points, cabling and associated , instruments , level sensors/electrodes/floats etc for the inlet works
- Supply and install new MCC including PLC for the new inlet works and for the new TT1 aerators and motorised sluice gates
- Supply and install stop locks adjacent all aerators and sluice gates
- Supply and instal new cables to the aerators , sluice gates , motor heaters,/\$ thermisters and stop locks
- Supply and installation of new cables to all DO sensors, other sensors , instruments etc
- Supply and installation of all cable support ladders and trays
- Trenching and backfilling for cables
- Lightning protection and earthing for the TT1 Aerator MCC building
- New lights and power points for the MCC building and associated areas
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.2 WWTW - RECYCLE SLUDGE PUMPS AND SEDIMENTATION TANKS 1 & 2 - TT1

- Disconnect and remove the existing MCCs for the existing sludge recycle pumps and existing sedimentation tank rotating bridge motors
- Disconenct and remove the cabling etc for the existing TT1 recycle pumps, bridge motors and asociated equipment, instruments , sensors etc
- Disconnect and remove the existing electrics, lights , power points,, level sensors etc for the recycle pumps and sedimentation tank bridge equipment and motors
- Supply and install new MCC for the new TT1 sludge recycle pumps and sedimentation tank rotating bridge motors
- Supply and install stop locks adjacent all recycle pumps and sedimentation tank bridge motors
- Supply and install local control panel for the sedimentation bridge motors
- Supply and instal new cables to the sludge pumps , sedimentation tanks bridge motors , motor heaters & thermisters and stop locks
- Supply and installation of new cables to all level sensors , level electrodes and floats, instruments etc
- Supply and installation of all cable support ladders and trays
- Trenching and backfilling for cables
- Lightning protection and earthing for the TT1 Sludge Pumps MCC building
- New lights and power points for the Sludge Pumps MCC building and associated areas
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.3 WWTW - TT2 AERATORS & MAIN SUBSTATION / LV PANEL (SITE POWER)

- Disconnect and remove the existing Main LV Panel/MCC for the existing TT2 aerators and existing feeders for other MCCs & DBs
- Disconenct and remove the cabling etc for the existing TT2 aerators and asociated equipment, instruments , sensors, stop locks etc
- Disconnect and remove the existing electrics, lights , power points, level sensors etc for the areators and MCC building
- Supply and install new Main LV Panel/MCC01 for the site power supply and for the new TT2 areators and automated sluice gate motors

- Supply and install stop locks adjacent all aerators and sluice gate motors
- Supply and instal new cables to the aerators , sluice gate motors , motor heaters, thermisters and stop locks etc
- Supply and installation of new cables to all level sensors , level electrodes , floats, instruments etc
- Supply and installation of all cable support ladders and trays
- Trenching and backfilling for cables
- Lightning protection and earthing for the TT2 Main Switch and transformer building
- New lights and power points for the TT2 maSludge Pumps MCC building and associated areas
 - Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.4 WWTW - TT2 SLUDGE PUMPS AND SEDIMENTATION TANKS 3 - 4

- - Disconnect and remove the existing MCCs for the existing sludge recycle pumps and existing sedimentation tank rotating bridge motors
 - Disconenct and remove the cabling etc for the existing TT2 sludge pumps, sedimentation tank bridge motors and asociated equipment, instruments , sensors etc
 - Disconnect and remove the existing electrics, lights , power points,level sensors etc for the recyclesludge pumps and sedimentation tank bridge equipment and motors
 - Supply and install new MCC for the new TT2 sludge recycle pumps and sedimentation tank rotating bridge motors
 - Supply and install stop locks adjacent all recycle pumps and sedimentation tank bridge motors
 - Supply and install local control panel for the sedimentation tank bridge motors
 - Supply and instal new cables to the sludge pumps , sedimentation tanks bridge motors , motor heaters , thermisters and stop locks etc
 - Supply and installation of new cables to all level sensors , level electrodes, floats, instruments etc
 - Supply and installation of all cable support ladders and trays
 - Trenching and backfilling for cables
 - Lightning protection and earthing for the TT2 Sludge Pumps MCC building
 - New lights and power points for the Sludge Pumps MCC building and associated areas
 - Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.5 WWTW - TT3 INLET WORKS

- - Supply and installation of a new MCC including PLC for the inlet works to supply the mechanical screen, conveyor, compactor etc
 - The emergency stop locks adjacent the new mechanical screens , conveyor etc
 - The cabling to the mechanical screen motors , conveyor motors , compactor motors etc
 - The supply and installation of main power cabling from the Main LV Panel to the new MCC and other associated equipment including all cable trays and support systems.
 - The supply and installation of new lights and power socket outlets for the structure over the inlet works.
 - The lightning protection and earthing for the screens building structure.
 - Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.6 WTW – CHLORINE/CHEMICAL DOSING BUILDING (FUTURE – NOT REQUIRED UNDER PHASE 1)

- - Disconnect and remove the existing MCCs in the existing chlorine and chemical dosing building
 - Disconnect and remove the existing electrics, lights , power points, cabling and lighing , level sensors etc for the existing chlorine and chemical dosing building and equipmnt
 - The emergency stop locks adjacent each new chlorine or other dosing pump motor , mixer and feeders etc
 - The cabling to the dosing pump motors , mixers and local control panel

- The supply and installation of a new DB in the building for lighting and power etc
- The supply and installation of a new MCC including PLC and local control panels for the new dosing pumps and ancillary equipment.
- The supply and installation of main power cabling from the Main LV Panel to the new MCC and other associated equipment including all cable trays and support systems.
- The supply and installation of new lights and power socket outlets in the existing building.
- The supply and installation of termination boxes for all pumps and instruments etc
- The supply and installation of new power points for the extract fans.
- The supply and installation of extract fans
- The lightning protection and earthing for the existing chlorine building
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.7 WWTW – SITE AND GENERAL

- - Supply and installation of new power cabling from the ex transformer / meter panel to the new Main LV Panel – MCC01
 - The supply and installation of power cabling from the Main LV Panel to the new MCCs for all buildings
 - All trenching and backfilling for power and instrumentation cabling
 - All site wide cable sleeves and manholes (manholed by civil contractor)
 - Supply and installation of new stand-by generator for the WWTW site
 - Disconnect and remove existing and redundant poles with streetlights and floodlights
 - Supply and install new site streetlights and floodlights with poles
 - External lighting on buildings
 - Signage

PS 9.2.1.8 WWTW - INSTRUMENTATION

- - The supply and installation of new venturi type flow meter at the inlet to the works for TT1
 - All instrument power and instrumentation cabling
 - Ultrasonic level indicators on the aeration basins (level measurement)
 - Solenoid valves on the poly dosing lines and pumping system
 - Level control electrodes and float switches
 - Dissolved oxygen (DO) sensors in the aeration basins for automatic control of the aerators
 - Upgrade to the existing SCADA & PLC System in the Control Building.
 - All new PLCs, HMIs, I/O's, switches and sensors including remote I/O's as necessary.
 - UPS for the PLCs and control panels.
 - New on-site SCADA system
 - Upgrade to the existing SCADA System in the UGU Control Building.
 - New telemetry systems
 - Air pressure sensors on the blower air pipeline (future phase 2)
 - Flow meter on the blower air pipeline (future phase 2)

PS 9.2.1.9 PUMP STATIONS – MARGATE PUMP STATION 1

- - - Disconnect and remove the existing MCCs for the existing pumps (2 x 22 kW pumps Gorman Rupp V4 Series)
 - Disconnect and remove the existing cabling to the existing pumps , stop locks, instruments, level control instruments/sensors etc complete for the existing pump station
 - Disconnect and remove the existing electrics, lights , power points, , level for the existing pump station
 - The supply and installation of a new MCC including PLC for the new pumps and ancillary equipment.
 - Relocation of the existing Eskom electricity meter to higher level
 - The supply and installation of a new DB for the building lighting and power

- The supply and installation of main power cabling from the Eskom meter to stand-by generator and to the new MCC including all cable trays and support systems.
- The supply and installation of main power cabling from the new MCC the new pumps, pump sensors , stop locks , level electrodes and float switches, other sensors and instruments including all cable trays and support systems.
- Stop lock stations adjacent each pump
- The supply and installation of new lights and power socket outlets.
- The supply and installation of termination boxes for all pumps and instruments etc
- The supply and installation of new power points for the new extract fans.
- The supply and installation of extract fans in the pump station
- The lightning protection and earthing for the pump station building.
- New telemetry system and integrate to SCADA system at UGU Control Room
- Supply and installation of new stand-by diesel generator

PS 9.2.1.10 PUMP STATIONS – MARGATE PUMP STATION 1A

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- Disconnect and remove the existing MCCs for the existing pumps (2 x 13,5 kW submersible pumps)
- Disconnect and remove the existing cabling to the existing pumps , stop locks, instruments, level control instruments/sensors etc complete for the existing pump station
- Disconnect and remove the existing electrics, lights , power points, cabling and lighting etc in the existing pump station
- The supply and installation of a new MCC including PLC for the new submersible pumps and ancillary equipment.
- The supply and installation of a new DB in MCC for the building lighting and power
- The supply and installation of main power cabling from the Eskom meter to stand-by generator and to the new MCC including all cable trays and support systems.
- The supply and installation of main power cabling from the new MCC the new new pumps, pump sensors , stop locks , level electrodes and float switches, other sensors and instruments including all cable trays and support systems.
- Stop lock stations adjacent each pump
- The supply and installation of new lights and power socket outlets.
- The supply and installation of termination boxes for all pumps and instruments etc
- The supply and installation of new power points for the new extract fans.
- The supply and installation of extract fans in the pump station
- The lightning protection and earthing for the pump station building.
- New telemetry system and integrate to SCADA system at UGU Control Room
- Supply and installation of new stand-by diesel generator

PS 9.2.1.11 PUMP STATIONS – MARGATE PUMP STATION 3A

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- Disconnect and remove the existing MCCs for the existing pumps (3 x 75 kW pumps immersible type)
- Disconnect and remove the existing cabling to the existing pumps , stop locks, instruments, level control instruments/sensors etc complete for the existing pump station
- Disconnect and remove the existing electrics, lights , power points, cabling and lighting etc complete for the existing pump station
- The supply and installation of a new MCC including PLC for the new pumps and ancillary equipment.
- Reconnection of the power to the existing Eskom electricty meter and mini-sub
- The supply and installation of a new DB for the building lighting and power
- The supply and installation of main power cabling from the Eskom meter/mini-sub to stand- by generator and to the new MCC including all cable trays and support systems.

- The supply and installation of main power cabling from the new MCC to the new pumps, pump sensors , stop locks , level electrodes and float switches, other sensors and instruments including all cable trays and support systems.
- Stop lock stations adjacent each pump
- The supply and installation of new lights and power socket outlets.
- The supply and installation of termination junction boxes for all pumps and instruments etc
- The supply and installation of new power points for the new extract fans.
- The supply and installation of extract fans in the pump station
- The lightning protection and earthing for the pump station building.
- New telemetry system and integrate to SCADA system at UGU Control Room
- Refurbishment, repairs and servicing of existing 500kVA stand-by diesel generator

PS 9.2.1.12 PUMP STATIONS – MARGATE PUMP STATION 4A

- - - Disconnect and remove the existing MCCs for the existing pumps (3 x 75 kW pumps immersible type)
 - Disconnect and remove the existing cabling to the existing pumps , stop locks, instruments, level control instruments/sensors etc complete for the existing pump station
 - Disconnect and remove the existing electrics, lights , power points, cabling and lighting etc in the existing pump station
 - The supply and installation of a new MCC including PLC for the new pumps and ancillary equipment
 - New cabling and reconnection to Eskom meter and 11kV sub-station
 - The supply and installation of a new DB for the building lighting and power
 - The supply and installation of main power cabling from the Eskom meter to stand-by generator and to the new MCC including all cable trays and support systems.
 - The supply and installation of main power cabling from the new MCC to the new new pumps, pump sensors , stop locks , level electrodes and float switches, other sensors and instruments including all cable trays and support systems.
 - Stop lock stations adjacent each pump
 - The supply and installation of new lights and power socket outlets in pump station.
 - The supply and installation of termination junction boxes for all pumps and instruments etc
 - The supply and installation of new power points for the new extract fans.
 - The supply and installation of extract fans in the pump station
 - Supply and installation of new electric hoist for lifting of pumps (15m lift)
 - The lightning protection and earthing for the pump station building.
 - New telemetry system and integrate to SCADA system at UGU Control Room
 - Refurbishment, repairs and servicing of existing 500kVA stand-by diesel generator
 - Relocation of the existing generaor set complete to the new generator room to be constructed

PS 9.2.1.17 STAND-BY GENERATORS

- - - New stand-by generator is required for the Margate WWTW site
 - New stand-by generator is required for the Margate Sewer Pump Station 1
 - New stand-by generator is required for the Margate Sewer Pump Station 1A
 - Refurbishment, repairs and servicing of the existing generator for Margate Sewer Pump Station 3A
 - Refurbishment, repairs and servicing of the existing generator for Margate Sewer Pump Station 4A including relocation to the new generator room

Refer to clause PS 5.7 for the specification and requirements of the generators. The Refurbishment of the existing generators are covered by provisional sums in the contract to be supplied and installed by a specialist generator manufacturer/supplier.

PS 9.2.1.18 TESTING AND COMMISSIONING

- - - Testing, commissioning, handing over of the complete electrical installation
 - Coordination with the Supply Authority for all required tests, shutdowns, etc.
 - Testing of all new installations in accordance with SANS 10142 and the issue of a Certificate of Compliance for each building or installation.

PS 9.2.2 MECHANICAL

The Mechanical Systems comprise of the following:

- 1. Extract fans for the pump stations and other MCC buildings
 2. Split type air-conditioning units for the existing Admin and Control Building.
 3. Portable handheld fire extinguishers in all areas
 4. Fire signage in all areas
 5. Pumps, motors and other mechanical equipment are covered elsewhere in the tender
 6. Process and treatment plant equipment are covered elsewhere in the tender

PS 5.2.2 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) The telephone/data/IT/PA/CCTV/alarm/intercom/security and fire detection wiring, equipment and connections.
- b) Geysers and hot water appliances or apparatus
- c) Solar power systems
- d) The intercom/security, fire detection wiring, equipment and connections.
- e) The Eskom incoming main supply covered by the supply authorities responsibilities to a defined consumer responsibility point.
- f) Any item of a building or structural component including louvres , grilles etc
- g) Builders work details , openings in brickwork , floors , slabs etc.
- h) Manholes
- i) Mechanical equipment, pumps and motors etc (by mechanical contractor)

PS 5.3 DRAWINGS

The drawings generally show the scope and extent of the proposed work and shall not be held as showing very minute detail of the work to be executed.

MAR001-E-001 - Site Plan Electrical Distribution and Reticulation Layout

MAR001-E-002 - Existing Electrical Distribution and Reticulation Layout – Single Line Diagram
MAR001-E-003 - Optimised New Main Electrical Distribution and Reticulation Layout – Single Line Diagram

Other drawings will be provided during the construction stages of the project.

The position of power points, switches and light points that may be influenced by built-in furniture must be established on site, prior to these items being, built in.

The electrical or other contractors shall on a separate set of drawings mark up in red ink any variation from the original drawings as and when it occurs.

Once a month these drawings will be provided to the Engineer or his representative/agent for inspection and approval. Within one week after completion of the project, the electrical contractor shall submit two sets "As Built" drawings to the Engineer in CAD format and also in PDF format.

Drawings and Specifications

The Contractor shall conform minutely to the drawings and specifications and to any written instructions, which the Engineer may issue during the contract.

Should any contradictions, differences or lack of information exist in the documents, it shall be binding on the Contractor to approach the Engineer for written clarification, which clarification shall be final. and binding.

PS 5.4 POWER SUPPLY & ELECTRICAL SYSTEMS

PS 5.4.1 MAIN INCOMING POWER SUPPLY

The existing power supply authority is Eskom. The existing power to the Margate WWTW site is from the underground power cable system rated at 11 kV terminating onto the transformer. The Margate WWTW internal MV reticulation and switchgear and transformer is rated at 11/0.4kV. The point of supply is the Client's internal 400Volt switchgear and meter.

The power supply to the existing pump stations 1 &, 1A is from the Eskom meter available at 400Volts. The power supply to the existing pump stations 3A & 4A is from the Eskom 11kV/0,4kV substation or mini-sub via the electricity meter and is available at 400Volts

The load-side terminals of the Eskom or Supply Authority kiosk or mini-sub forms the upstream battery limit for the site electrical works.

The contractor shall co-ordinate all necessary with Eskom or Supply Authority to ensure a safe working environment.

Such co-ordination shall include joint lock-out procedures and safety inspections before work commences.

The Contractor shall note that the new or existing supply infrastructure route is to be established in trenching and ducts. The contractor shall make good and seal the transition into the substation on completion of the project.

All standards, procedures, regulations and specifications of the Supply Authority shall be adhered to regarding the trenching for, installation and commissioning of the main supply cable to the site.

A copy of the relevant documentation shall be provided to the successful tenderer on request.

The contractor shall be responsible to liaise with Eskom or the Local Municipality for the upgraded 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 which included as provisional sums covered under the bill of quantities. This amount is provisional only and a final cost will be obtained from Eskom or the Supply Authority after the power supply application is made.

PS 5.4.2 RETICULATION ON SITE

The existing low voltage supply distribution and reticulation on site is a 230/400volts system. All new systems shall match this rating.

System Details:

ITEM	DESCRIPTION
System nominal voltage	400/230 V
System highest voltage	420/250 V
Neutral earthing	Solid
Nominal system frequency	50 Hz
Number of phases	3
Design symmetrical Three Phase Fault Level at Main MCC Panel	15kA

PS 5.5 CONTROL PANELS, MCC's & DISTRIBUTION BOARDS

PS 5.5.1 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"

PS 5.5.2 Drawings and Data by Contractor

The contractor 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 prior to manufacture :

- - Wiring and layout diagrams of all motor control panels, local control panels, main panels, distributions boards
 - Component and parts list of all motor control panels and distribution boards
 - FDS (Functional Design Specifications)
 - P & I D diagrams for the entire project
 - Process flow diagrams
 - PLC wiring diagrams
 - PLC I/O lists
 - PLC program
 - Process control network diagrams
 - Instrument loop block diagrams
 - Instrument tag numbers
 - Cable schedule and numbering (power and instrumentation)
 - Cable block diagrams

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.

The circuit breaker types shall match the existing. The current circuit breakers are as supplied by ABB or similar and equal approved. The circuit breaker installations must include all cut-outs, device plates, wiring , terminations , connections , labelling etc complete.

PS 5.5.3 MAIN LV PANEL MCC 01 (& TT2 AERATION)

The aeration, pumping and chemical dosing systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring system shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Ex Main Substation & TT2 Aerator Building. The final position shall be determined later depending if it can fit in the positions shown.

The Main LV Panel MCC 01 shall be equipped with all the necessary feeders or starters for the various aerators, pumping plant, chemical dosing systems etc and for the various instruments. The Main Panel shall also supply the feeders to the various other MCC s and DBs on site All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and manually from the SCADA.

The MCC main switch shall be rated at 1000 Amps three phase at a fault level of 20 kA. The panel shall be extensible and have bottom cable entry with facilities for future top cable entries. Cable ways shall be allowed in the panel from top to bottom.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be fed from stand-by generator supply during mains failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 1000A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded. 1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors. (mounted in separate cubicle with see-through view panel) 1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring 1 x Power Meter with panel mounted display

Panel 2: Soft Starter for 30kW 400V Aerator 5

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 contactor before the starter

1 No Elsec of similar approved earth leakage relay for outdoor motor protection

1 No. Soft Starter 30kW with suitable overload and anti – single phase 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 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

1 Set Control equipment, relays, contacts etc. for local manual and remote automatic and manual start/stop and controls as described in the FDS and control section.

This panel shall be labelled "Aerator 5 "

Panel 3: Soft Starter for 30kW 400V Aerator 6

This panel shall be similar to Panel No 2 for Aerator 5 This panel shall be labelled "Aerator 6 "

Panel 4: Soft Starter for 30kW 400V Aerator 7

This panel shall be similar to Panel No 2 for Aerator 5 This panel shall be labelled "Aerator 7 "

Panel 5: DOL Starter for 3kW 400V Aerator Basin Sluice Gate 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 contactor before the drive

1 No Elsec or similar earth leakage unit for outdoor motor protection

1 No. DOL Starter Contactor 3kW with suitable overload and anti – single phase 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 Adjustable timer for automatic control of the sluice gate

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

1 Set Control equipment, relays, contacts etc. for local manual and remote automatic and manual start/stop and controls as described in the FDS.

This panel shall be labelled " Sluice Gate 1 "

Panel 6: DOL Starter Contactor for 3kW 400V Sluice Gate 2 This panel shall be similar to Panel No 6 for Sluice Gate 1 This panel shall be labelled "Sluice Gate 2 "

Panel 7: Spare Panel

1 No. Suitably rated DP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.

Panel 8 : Marshalling

Terminals, bases, relays etc. as required

Panel 9 : Main Distribution & Domestic Local DB

1. No 600Amp TP Amp Main Switch and busbars 1 No 60Amp/30mA Earth Leakage Units (plugs) 2 x 15 Amp TP CB (feed to extract fans)
2. x 15 Amp SP CB (feed to single phase fans) 2 x 10 Amp SP CB's

3. x 5 Amp SP CB (by-pass switch)

4. x 20 Amp SP CB's (plugs and other)

2 x 30 Amp TP CB's (Feed to Chlorine Dosing MCC07 & Ex Offices

2 x 10 Amp TP CB's (Feed to Ex Nursery MCC , Waste Recycle Pumps MCC03 & Sludge Recirculation Pumps MCC10)

2 x 100 Amp TP CB's (Feed to Sludge Return Pumps MCC04 & Sludge Dewatering MCC08) 1 x 400 Amp TP CB's (Feed to New Blower MCC05)

1. x 100 Amp TP CB's (Spare) 1 x 200 Amp TP CB's (Spare)

Panel 10: 24 V DC Power Supply

1x 30 Amp TP main switch and busbars 2 x 10Amp SP Circuit breakers

1. x 5Amp 24V DC Power supply and busbars – feed to DO sensors 10 x 2Amp SP Circuit breakers – feed to future level sensors

Panel 11 : PLC & HMI

The cabinet shall be free standing having the same width and height as the MCC or incorporated into the MCC.

The PLC including the HMI as described under the PLC instrumentation section and per the FDS and P&IDs shall be installed in this panel. The PLC shall be in accordance with Standard Industry Specification for Instrumentation and shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the chemical dosing systems.

The HMI in MCC01 shall be the main master HMI with all signals coming back from the other slave PLCs on site.

All plant status for the entire site is to be displayed on this HMI together with all pages, trends etc.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All aerators status - run, stop , trip, e-stop etc

All sluice gates – open, closed, run , stop , trip, e-stop etc

The electrical contractor shall provide the final I/O lists for comments and approval. Controls :

All aerators, sluice gates and other pumps etc shall be automatically controlled by the PLC with facilities for manually or remotely controlling from the SCADA system. Timers built into the PLC program shall control all the aerators and sluice gates etc.

The entire aeration system (3 aerators) shall be automatically controlled by the DO sensor/s (dissolved oxygen sensors) in the aeration basin for TT2. The final control system shall be developed with the appointed contractor and panel builder. This must be priced in the tender.

PS 5.5.4 MCC 02 TT1 AERATORS / CLARIFIERS

The aerators and clarifier systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the TT1 MCC Building. The final position shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the aerators, clarifiers and other equipment and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 100 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries. A cable way shall be allowed for on one end of the panel from top to bottom.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be fed from stand-by generator supply during mains failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 100A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors. (mounted in separate cubicle with see-through view panel) 1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring 1 x Power Meter with panel mounted display

Panel 2: Soft Starter 30kW 400V Aerator 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 contactor before the starter

1 No Elsec or similar earth leakage unit for outdoor motor protection

1 No. Soft Starter for 30kW Aerator with suitable overload and anti – single phase 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 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 1 Motor heater circuit

1 Motor thermistors circuit 1 Vent fan and circuit

1 Set Control equipment, relays, contacts etc. for local manual and remote automatic and manual start/stop and controls as described in the FDS.

This panel shall be labelled “ Aerator 1 “ Panel 3: Soft Starter for 30W 400V Aerator 2

This panel shall be similar to panel no 2 for Aerator No 1 This panel shall be labelled “ Aerator 2 “

Panel 4: Soft Starter for 30W 400V Aerator 3

This panel shall be similar to panel no 2 for Aerator No 1 This panel shall be labelled “ Aerator 3 “

Panel 5: Soft Starter for 30W 400V Aerator 4

This panel shall be similar to panel no 2 for Aerator No 1 This panel shall be labelled “ Aerator 4 “

Panel 6: DOL Starter for 3kW 400V Aerator Basin Sluice Gate 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 contactor before the drive

1 No Elsec or similar earth leakage unit for outdoor motor protection

1 No. DOL Starter Contactor 3kW with suitable overload and anti – single phase 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 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

1 Set Control equipment, relays, contacts etc. for local manual and remote automatic and manual start/stop and controls as described in the FDS.

This panel shall be labelled “ Sluice Gate 1 “

Panel 7: DOL Starter Contactor for 3kW 400V Sluice Gate 2 This panel shall be similar to Panel No 6 for Sluice Gate 2 This panel shall be labelled “Sluice Gate 2 “

Panel 8: DOL Starter for 3kW 400V 3kW Clarifier 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 contactor before the drive

1 No Elsec or similar earth leakage unit for outdoor motor protection

1 No. DOL Starter Contactor 3kW with suitable overload and anti – single phase 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 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

1 Set Control equipment, relays, contacts etc. for local manual and remote automatic and manual start/stop and controls as described in the FDS.

This panel shall be labelled " Clarifier 1 "

Panel 9: DOL Starter Contactor for 3kW Clarifier 2 This panel shall be similar to Panel No 8 for Clarifier 2 This panel shall be labelled "Clarifier 2

Panel 10: Spare Panel

1. No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.

Panel 11 : 24 V DC POWER SUPPLY

1x 30 Amp TP main switch and busbars 2 x 10Amp SP Circuit breakers

1. x 5Amp 24V DC Power supply and busbars – feed to DO sensors 10 x 2Amp SP Circuit breakers – feed to future level sensors

Panel 12 : Marshalling

Terminals, bases, relays etc. as required Panel 13: Domestic Local DB

1. No 32 TP Amp Main Switch and busbars
2. No 60Amp/30Ma Earth Leakage Units (plugs) 2 x 15 Amp TP CB (feed to extract fans)

2 x 15 Amp SP CB (feed to single phase fans)

2 x 20 Amp TP Contactors with stop/start pushbuttons and run/stop/trip indicator lights

2 x 10 Amp SP CB's

1 x 5 Amp SP CB (by-pass switch)

15 x 20 Amp SP CB's (plugs and other) 1 x 10 Amp TP CB's (Spare)

Panel 14 : PLC

The cabinet shall be free standing having the same width and height as the MCC or shall be incorporated into the MCC.

The PLC as described under the PLC instrumentation section and per the FDS and P&IDs shall be supplied and installed in the PLC cubicle in accordance with Standard Industry Specification for Instrumentation. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the chemical dosing systems.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

Signals from the slave PLC shall be taken to the Main HMI in MCC01. The main HMI is to be programmed with all the aerator and sluice gate status from MCC02.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All aerators status - run, stop , trip, e-stop etc

All sluice gates – open, closed, run , stop , trip, e-stop etc

The electrical contractor shall provide the final I/O lists for comments and approval. Controls :

All aerators, sluice gates and other pumps etc shall be automatically controlled by the PLC with facilities for manually or remotely controlling from the SCADA system. Timers built into the PLC program shall control all the aerator and sluice gates etc.

The entire aeration system (4 aerators) shall be automatically controlled by the DO sensor/s (dissolved oxygen sensors) in the aeration basin and or with a timer based control system. The final control system shall be developed with the appointed contractor and panel builder. This must be priced in the tender.

The electrical contractor shall provide the final I/O lists for comments and approval.

PS 5.5 5 MCC- 03 WASTE RECYCLE PUMPS

The pumping systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Waste Recycle Pump Building. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips,

alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 100 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be fed from stand-by generator supply during mains failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 100A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses . (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display Panel 2: Duty VSD Starter for 15kW Mixed Liquor Waste 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. 15kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay for motor temperature protection 1 No motor heater circuit

1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled " Mixed Liquor Pump 1 "

Panel 3 : Stand-By VSD Starter for 15kW Mixed Liquor Waste Pump 2 This panel shall be similar to Panel No 2 for Mixed Liquor Pump 1 This panel shall be labelled "Mixed Liquor Pump 2 "

Panel 4: Duty VSD for 7,5kW 400V Sludge 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. 7,5kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop and PLC controls and interface

This panel shall be labelled "Sludge Recycle Pump 2 "

Panel 5 : Stand-By VSD Starter for 7,5W Sludge Recycle Pump 2 This panel shall be similar to Panel No 2 for Sludge Recycle Pump 1 This panel shall be labelled "Sludge Recycle Pump 2 "

Panel 6: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers (future use)

Terminals, bases, relays etc. as required Panel 6: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1. x 60Amp/30mA earth leakage unit 2 x 20 Amp SP CB's(plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 7: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC.

The PLC as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

Signals from the PLC shall be taken to the Main HMI in MCC01. The main HMI is to be programmed with all the motor status, pages and trends from MCC03.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All pump/s status - run, stop , trip, overload , anti-single phasing etc All pumps e-stop

Suction sump levels Low level stop

No flow trip

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All duty pumps are automatically controlled by the levels in the suction sump or manually and remotely controlled from the SCADA system. The duty pumps are to be controlled (stop and start) by level electrodes installed in the suction sump The levels shall be monitored by the level sensor in the suction sump. The pumps shall also be manually controlled with all protection in place. All pumps shall stop should there be a low level in the suction sump, stopped by level floats . A no flow switch on the delivery pipe shall trip all pumps should a no flow condition arise. The stand-by pump/s should automatically start should any of the duty pumps trip or fail.

PS 5.5.6 MCC04 - SLUDGE RETURN PUMPS

The pumping systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Sludge Return Pumps Building. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption,

power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 100 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be fed from stand-by generator supply during mains failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 100A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses . (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display Panel 2: Duty VSD Starter for 15kW Sludge Return 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. 15kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled " Sludge Return Pump 1 "

Panel 3 : Stand-By VSD Starter for 15kW Sludge Return Pump 2 This panel shall be similar to Panel No 2 for Sludge Return Pump 1 This panel shall be labelled "Sludge Return Pump 2 "

Panel 4: Duty DOL Starter for 3kW 400V Clarifier 3

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. 3kW DOL Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop and PLC controls and interface

This panel shall be labelled "Clarifier 3 "

Panel 5 : Stand-By DOL Starter for 3kW Clarifier 4 This panel shall be similar to Panel No 4 for Clarifier 4 This panel shall be labelled " Clarifier 4 "

Panel 6: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers

Terminals, bases, relays etc. as required Panel 6: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1. x 60Amp/30mA earth leakage unit 2 x 20 Amp SP CB's(plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 7: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC.

The PLC as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

Signals from the PLC shall be taken to the Main HMI in MCC01. The main HMI is to be programmed with all the pump & motor status, pages and trends from MCC04.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All pump/s status - run, stop , trip, overload , anti-single phasing etc All pumps e-stop

Suction sump levels Low level stop

No flow trip

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All duty pumps are automatically controlled by the levels in the suction sump or manually and remotely controlled from the SCADA system. The duty pumps are to be controlled (stop and start) by level electrodes installed in the suction sump The levels shall be monitored by the level sensor in the suction sump. The pumps shall also be manually controlled with all protection in place. All pumps shall stop should there be a low level in the suction sump. A no flow switch on the delivery pipe shall trip all pumps should a no flow condition arise. The stand-by pump/s should automatically start should any of the duty pumps trip or fail.

The clarifiers are to be manually started and stopped and also automatically via an adjustable timer based system.

PS 5.5.7 MCC - 05 NEW BLOWERS (FOR FUTURE USE - Phase 2)

Rate only price to be provided.

The blower systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Existing Blower Room Building. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various blowers or pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power

consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 400 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

The panel will be fed from the stand-by generator supply should the mains power fail. Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 400A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses . (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display Panel 2: Duty VSD Starter for 45kW 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. 45kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled " Blower 1 "

Panel 3 : Duty VSD Starter for 45kW Blower 2

This panel shall be similar to Panel No 2 for Blower 1

This panel shall be labelled "Sludge Return Pump 2 " This panel shall be labelled " Blower 2 "

Panel 4 : Duty VSD Starter for 45kW Blower 3

This panel shall be similar to Panel No 2 for Blower 1 This panel shall be labelled "Blower 3 "

Panel 5 : Duty VSD Starter for 45kW Blower 4

This panel shall be similar to Panel No 2 for Blower 1 This panel shall be labelled "Blower 4 "

This panel shall be labelled " Blower 1 "

Panel 6 : Duty VSD Starter for 45kW Blower 5

This panel shall be similar to Panel No 2 for Blower 1 This panel shall be labelled " Blower 5 "

Panel 7: Duty DOL Starter for 3kW Mechanical Screen 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 Elsec or similar earth leakage unit for pump protection

1 No. 3kW DOL Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop and PLC controls and interface

This panel shall be labelled "Mechanical Screen 1 " Panel 8 : Stand-By DOL Starter for 3kW Conveyor 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. 3kW DOL Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 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 Set Control equipment, relays, contacts, timers, interlocks etc. for local manual and remote automatic and manual start/stop and PLC controls and interface

This panel shall be labelled " Conveyor 1 " Panel 9: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers (future use)

Terminals, bases, relays etc. as required Panel 10: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1. x 60Amp/30mA earth leakage unit 2 x 20 Amp SP CB's (plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 11: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC.

The PLC including HMI as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle.

The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

An HMI is required in this MCC-05. Signals from the PLC shall be taken to the Main HMI in MCC01. The main HMI is to be programmed with all the blower, screens and motor status, pages and trends etc from MCC05.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All blower and screens /s status - run, stop , trip, overload , anti-single phasing etc All blower e-stops etc

Levels in aeration basin air chamber Pressure information in the air pipeline

Oxygen sensor information

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All blowers are automatically controlled by the oxygen levels (DO sensors) in the aeration basin air chamber or manually and remotely controlled from the SCADA system. The duty blowers are to be controlled (stop and start) by air pressure sensors installed in the delivery air line. The blowers shall also be manually controlled with all protection in place. All blowers or other motors shall stop should there be a low pressure in the air line or low level in the aeration sump. A pressure switch on the delivery pipe shall trip all blowers should a no flow condition arise. The stand-by blowers or pump/s and other equipment should automatically start should any of the duty blowers or other equipment trip or fail.

The mechanical screens and conveyor are to be manually started and stopped with facilities for automatic control by adjustable timer based system.

PS 5.5.8 MCC - 08 SLUDGE DEWATERING PLANT & EQUIPMENT (FOR FUTURE USE)

The MCC shall be outdoor, weatherproof type wall mounted or fixed to Dewatering Plant Building constructed of 1,6mm 3CR12 sheeting and painted epoxy powder coated electric orange or red for generator supply. The panel shall have a lockable door. The panel shall be rated for a fault level of 15kA.

The panel shall be equipped as follows:

Panel 1 - Incomer

1 x 100A TP main switch isolator interlocked with the panel door. All live parts should be shrouded. 1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4x Surge arrestors.

1 x Voltmeter selector switch P/N, PP.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs and 96 mm square MDI ammeter 0 – 100 Amps 1 x Power Meter Schneider PM5560 with panel mounted display

Panel 2 - Soft Starter for 4,5kW 400V Dewatering Screw Press

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW Soft Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

1 No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 2 - DOL Starter for 4,5kW 400V Dewatering Dosing Equipment

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 7,5kW DOL Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

1 No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 3 - DOL Starter for 4,5kW 400V Dewatering Conveyor

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW DOL Starter (ABB or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

I No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 4 - DOL Starter for 4,5kW 400V Conveyor / Compactor

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW DOL Starter (ABB or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

I No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 3: Controls

1 No 10 Amp CB (main)

Set Timers, relays , contacts to automatically operate the screens , conveyor and compactor with r with manual stop and start overrides .

The screens and conveyor shall be automatically operated by the differential level sensor installed in the inlet channel and timed to open and close over 24 hours, 7 days a week. The sensor/detector shall be installed in the inlet channel on a purpose made stainless steel bracket.

The level detector electronic instrument shall be installed in this control cubicle Panel 4 : Domestic

1 x 20 A TP Main Switch and Busbars

2x 5 A TP CB (feed to electric actuated valves) 3 x 5 A SP CB (Feed to level sensor plus spare)

1 x 24V DC power supply for the feed to the level sensor 1 x 60Amp/30Ma Earth leakage unit

1 x 20 Amp SP CB (future plugs) Panel 5: PLC

The PLC and HMI for the dewatering equipment, detector etc as described under the PLC instrumentation section and FDS/P&IDs prepared by the panel builder shall be in accordance with the Industry Standards for Instrumentation and installed in the PLC cabinet.

The PLC Cabinet shall comprise the following:

- Circuit breakers
- Battery charger
- Battery
- PLC with rack if required
- PLC 24V DC power supply
- PLC controller
- 32 Digit input module
- 16 Digit output module
- 8 Analogue input modules
- Expansion modules
- Terminal blocks
- Managed switch
- Loop isolators
- Relay base
- Relays
- Terminal fuses
- Terminals

The screens, conveyor etc shall be automatically controlled by the level differential sensor with facilities for manually control and remotely controlled from the SCADA. An adjustable timer based system is also be to uses for automatically controls .

Signals from the PLC shall be taken to the Main HMI in MCC01. The main HMI is to be programmed with all the screens, conveyor etc status, pages and trends etc from MCC08.

I/O,s shall include but not limited to the following :

Power - on , off Manual or auto E-stop

Dewatering screw press, screens, conveyor etc status - run, stop , trip, overload , anti-single phasing etc

Inlet channel/sump levels

All dewatering equipment stop, trip and alarm

The electrical contractor shall provide the final I/O lists for comments and approval

The final input and output modules shall be determined by the contractor to suit the control functions per the FDS and P&IDs to be designed and submitted by the panel builder.

PS 5.5.9 MCC - 14 TT3 INLET WORKS

The MCC shall be outdoor, weatherproof type wall mounted or fixed to inlet works structure constructed of 1,6mm 3CR12 sheeting and painted epoxy powder coated electric orange or red for generator supply. The panel shall have a lockable door. The panel shall be rated for a fault level of 15kA.

The panel shall be equipped as follows:

Panel 1 - Incomer

1 x 50A TP main switch isolator interlocked with the panel door. All live parts should be shrouded. 1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4x Surge arrestors.

1 x Voltmeter selector switch P/N, PP.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs and 96 mm square MDI ammeter 0 – 100 Amps 1 x Power Meter Schneider PM5560 with panel mounted display

Panel 2 - DOL Starter for 4,5kW 400V Mechanical Raked Screen

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW DOL Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

1 No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 2 - DOL Starter for 4,5kW 400V Mechanical Raked Screen (Inlet Works)

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW DOL Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

1 No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 3 - DOL Starter for 4,5kW 400V Inlet Works Conveyor

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW DOL Starter (ABB or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

I No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 4 - DOL Starter for 4,5kW 400V Conveyor Compactor

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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 4,5kW DOL Starter (ABB or similar) with suitable overload and anti – single phase protection with Ethernet Port to PLC switch

I No HMI

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 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 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

Panel 3: Controls

1 No 10 Amp CB (main)

Set Timers, relays , contacts to automatically operate the screens , conveyor and compactor with r with manual stop and start overrides .

The screens and conveyor shall be automatically operated by the differential level sensor installed in the inlet channel and timed to open and close over 24 hours, 7 days a week. The sensor/detector shall be installed in the inlet channel on a purpose made stainless steel bracket.

The level detector electronic instrument shall be installed in this control cubicle Panel 4 : Domestic

1 x 20 A TP Main Switch and Busbars

2x 5 A TP CB (feed to electric actuated valves) 3 x 5 A SP CB (Feed to level sensor plus spare)

1 x 24V DC power supply for the feed to the level sensor 1 x 60Amp/30Ma Earth leakage unit

1 x 20 Amp SP CB (future plugs) Panel 5: PLC

The PLC and HMI for the screens , conveyor, compactor and level detector etc as described under the PLC instrumentation section and FDS/P&IDs prepared by the panel builder shall be in accordance with the Industry Standards for Instrumentation and installed in the PLC cabinet.

The PLC Cabinet shall comprise the following:

- Circuit breakers
- Battery charger
- Battery
- PLC with rack if required
- PLC 24V DC power supply
- PLC controller
- 32 Digit input module
- 16 Digit output module
- 8 Analogue input modules
- Expansion modules
- Terminal blocks
- Managed switch
- Loop isolators
- Relay base
- Relays
- Terminal fuses
- Terminals

The screens, conveyor etc shall be automatically controlled by the level differential sensor with facilities for manually control and remotely controlled from the SCADA. An adjustable timer based system is also be to uses for automatically controls .

Signals from the PLC shall be taken to the Main HMI in MCC01. The main HMI is to be programmed with all the screens, conveyor etc status, pages and trends etc from MCC14.

I/O,s shall include but not limited to the following :

Power - on , off Manual or auto E-stop

Screens, conveyor etc status - run, stop , trip, overload , anti-single phasing etc Inlet channel/sump levels Inlet channel low and high level screens and conveyor stop and alarm

The electrical contractor shall provide the final I/O lists for comments and approval

The final input and output modules shall be determined by the contractor to suit the control functions per the FDS and P&IDs to be designed and submitted by the panel builder.

PS 5.5.10 MCC 11 – MARGATE SEWER PUMP STATION 1

The pumping systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor or wall mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Margate Sewer Pump Station 1. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and

monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 100 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The panel will be fed from generator supply during mains failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 100A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses . (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display Panel 2: Duty VSD Starter for 22kW Sewer 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 Elsec or similar earth leakage unit for submersible pump motor protection

1 No. 22kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 No Oil Contamination Circuit (Water in Oil)

1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled " Sewer Pump 1 " Panel 3 : Stand-By VSD Stater for 22kW Pump 2

This panel shall be similar to Panel No 2 for Sewer Pump 1 This panel shall be labelled "Sewer Pump 2 "

Panel 3: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers (future use)

Terminals, bases, relays etc. as required Panel 4: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1 x 60Amp/30mA earth leakage unit

1. x 24V DC power supply for instruments, sensors etc 2 x 20 Amp SP CB's(plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 5: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC or built into the MCC.

The PLC and HMI as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

Signals from the PLC shall be taken to the telemetry panel for signals to be transmitted to the main SCADA at the UGU Control Room. The SCADA is to be integrated and programmed with all the motor status, pages, trends etc from the PLC in the MCC. The telemetry system is to form part of the electrical scope.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All pump/s status - run, stop , trip, overload , anti-single phasing etc All pumps e-stop

Suction sump levels Low level stop

No flow trip

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All duty pumps are automatically controlled by the levels in the suction sump or manually and remotely controlled from the SCADA system. The duty pumps are to be controlled (stop and start) by level electrodes installed in the suction sump The levels shall be monitored by the level sensor in the suction sump. The pumps shall also be manually controlled with all protection in place. All pumps shall stop should there be a low level in the suction sump via float switches. A no flow switch on the delivery pipe shall trip all pumps should a no flow condition arise. The stand-by pump/s should automatically start should any of the duty pumps trip or fail. The PLC shall be programmed to automatically rotate the pumps so that the run hours are similar.

PS 5.5.11 MCC 12 – MARGATE SEWER PUMP STATION 1A

The pumping systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Margate Sewer Pump Station 1A. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 100 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be supplied by stand-by generator during mains power failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 100A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses. (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display Panel 2: Duty VSD Starter for 22kW Sewer 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 Elsec or similar earth leakage unit for outdoor motor protection

1 No. 22kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 No Oil Contamination Circuit (Water in Oil)

1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled " Sewer Pump 1 " Panel 3 : Duty Assist VSD Starter for 22kW Pump 2

This panel shall be similar to Panel No 2 for Sewer Pump 1 This panel shall be labelled "Sewer Pump 2 "

Panel 6: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers

Terminals, bases, relays etc. as required Panel 6: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1 x 60Amp/30mA earth leakage unit

1. x 24V DC power supply for instruments, sensors etc 2 x 20 Amp SP CB's(plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 7: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC.

The PLC and HMI as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

Signals from the PLC shall be taken to the telemetry panel for signals to be transmitted to the main SCADA at the UGU Control Room. The SCADA is to be integrated and programmed with all the motor status, pages, trends etc from MCC PLC. The telemetry system is to form part of the electrical scope.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All pump/s status - run, stop , trip, overload , anti-single phasing etc All pumps e-stop

Suction sump levels Low level stop

No flow trip

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All duty pumps are automatically controlled by the levels in the suction sump or manually and remotely controlled from the SCADA system. The duty pumps are to be controlled (stop and start) by level electrodes installed in the suction sump The levels shall be monitored by the level sensor in the suction sump. The pumps shall also be manually controlled with all protection in place. All pumps shall stop should there be a low level in the suction sump via level floats. A no flow switch on the delivery pipe shall trip all pumps should a no flow condition arise. The stand-by pump/s or duty-assist pump should automatically start should any of the duty pumps trip or fail.

The PLC shall be programmed to automatically rotate the pumps so that the run hours are similar.

PS 5.5.12 MCC 13 – MARGATE SEWER PUMP STATION 3A

The pumping systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Margate Sewer Pump Station 3A. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 500 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size

and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be fed from stand-by generator supply during mains failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 500A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses . (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display Panel 2: Duty VSD Starter for 90kW Sewer 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 Elsec or similar earth leakage unit for submersible motor protection

1 No. 90kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 No Oil Contamination Circuit (Water in Oil)

1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled “ Sewer Pump 1 “ Panel 3 : Duty Assist VSD Starter for 90kW Pump 2

This panel shall be similar to Panel No 2 for Sewer Pump 1 This panel shall be labelled “Sewer Pump 2 “

This panel shall be labelled “ Sewer Pump 1 “ Panel 4 : Stand-By VSD Starter for 90kW Pump 3

This panel shall be similar to Panel No 2 for Sewer Pump 1 This panel shall be labelled “Sewer Pump 3 “

Panel 5: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers (future use)

Terminals, bases, relays etc. as required Panel 6: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1 x 60Amp/30mA earth leakage unit

1. x 24V DC power supply for instruments, sensors etc 2 x 20 Amp SP CB's(plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 7: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC.

The PLC and HMI as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

Signals from the PLC shall be taken to the telemetry panel for signals to be transmitted to the main SCADA at the UGU Control Room. The SCADA is to be integrated and programmed with all the motor status, pages, trends etc from MCC PLC. The telemetry system is to form part of the electrical scope.

The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All pump/s status - run, stop , trip, overload , anti-single phasing etc All pumps e-stop

Suction sump levels Low level stop

No flow trip

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All duty and duty-assist pumps are automatically controlled by the levels in the suction sump or manually and remotely controlled from the SCADA system. The duty and duty- assist pumps are to be controlled (stop and start) by level electrodes installed in the suction sump The levels shall be monitored by the level sensor in the suction sump. The pumps shall also be manually controlled with all protection in place. All pumps shall stop should there be a low level in the suction sump via level floats in the sump. A no flow switch on the delivery pipe shall trip all pumps should a no flow condition arise. The stand-by pump/s should automatically start should any of the duty or duty-assist pumps trip or fail.

The PLC shall be programmed to automatically rotate the pumps so that the run hours are similar.

PS 5.5.13 MCC 09 – MARGATE SEWER PUMP STATION 4A

The pumping systems shall be monitored and controlled with appropriate instrumentation in accordance with the Functional Design Specification (FDS) and the P&ID's to be designed and submitted by the electrical panel builder. All wiring and cabling for the control and monitoring shall be included.

A floor mounted IP55 motor control panel constructed of 3CR12 material epoxy powder coated shall be installed in the Margate Sewer Pump Station 4A. The final position and type of installation of the MCC shall be determined later depending if it can fit in the positions shown.

The MCC shall be equipped with all the necessary feeders or starters for the various pumping systems and for the various instruments. All critical panel components such as system trips, run, stop, off, power consumption, power loss etc. will be linked to the PLC system and linked back to the SCADA system. Interlocks, trips, alarms and trends shall be logged onto the SCADA history and monitored. 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 panel builder. Equipment shall be controlled manually locally in the MCC and remote automatically and remote manually from the SCADA.

The MCC main switch shall be rated at 650 Amps three phase at a fault level of 15 kA. The panel shall be extensible and have bottom cable entry with facilities for top cable entries.

The MCC size shall be as determined by the tenderer with each bucket to be 400 - 600mm wide in accordance with the single line diagrams or to suit the requirements of the specifications hereunder. The final size and design of the MCC shall be determined by the panel builder to suit the equipment to be installed. The general arrangement layout of the MCC is shown on drawing MAR001-E-001 to 003.

VSD's and soft starters shall have a removable, password locked keypad on door.

Power Analyser shall be Schneider type or equivalent and equal approved by the Employer's Representative or Engineer, with harmonic monitoring, IP enabled and interfaced to SCADA System.

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.

All equipment where 2 off are provided shall be operated on a 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.

The MCC will be fed from the stand-by generator during mains power failure.

All equipment shall be as supplied by Schneider, alternatives shall be accepted where no Schneider products are available.

Generally, the panel shall consist of the following:

Panel 1: Incomer

1 x 650A TP main switch circuit breaker interlocked with the panel door. All live parts shrouded.

1 x Set suitably rated copper busbars with insulators and earth bar with studs, bolts, nuts, washers, etc.

4 x Surge arrestors Class 1+2 and Fuses . (mounted in separate cubicle with see-through view panel)

1 x Voltmeter selector switch P/N, P/P.

1 x 96 mm square voltmeter 0 – 500 volts.

3 x suitable CTs for power and current monitoring

1 x Power Meter Schneider PM5560 with panel mounted display

Panel 2: Duty VSD Starter for 110kW Sewer Pump 1 (or to suit the final pump and motor kW selected)

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 Elsec or similar earth leakage unit for submersible motor protection

1 No. 110kW VSD Starter (Schneider or similar) with suitable overload and anti – single phase protection with Ethernet Port to 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 No 6A MCB (controls)

1 No PTC thermistor relay and motor heater circuit 1 No Oil Contamination Circuit (Water in Oil)

1 x timer (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 Vent fan and circuit to suit

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and remote automatic and manual start/stop with PLC controls and interface

This panel shall be labelled “ Sewer Pump 1 “

Panel 3 : Duty Assist VSD Starter for 110kW Pump 2 (or to suit the final pump and motor kW selected)

This panel shall be similar to Panel No 2 for Sewer Pump 1 This panel shall be labelled “Sewer Pump 2 “

This panel shall be labelled “ Sewer Pump 1 “

Panel 4 : Stand-By VSD Starter for 110kW Pump 3 (or to suit the final pump and motor kW selected) This panel shall be similar to Panel No 2 for Sewer Pump 1

This panel shall be labelled “Sewer Pump 3 “ Panel 5: Marshalling and Controls :

1 No 10Amp SP MCB (Mains)

1 No Suction sump level indicator with 1 x Aux contacts and 24V DC power supply Set Surge arresters

Set Relays for hard wire protection of pump sets and pump interlocks 2 No 6Amp SP CB (instrument power supplies)

3 No Indicator lights (Low suction level and no-flow) Set Timers (future use)

Terminals, bases, relays etc. as required Panel 6: Domestic Local DB

1 No 32 TP Amp Main Switch and busbars 2 x 10 Amp TP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1 x 60Amp/30mA earth leakage unit

1. x 24V DC power supply for instruments, sensors etc 2 x 20 Amp SP CB's(plugs)

2. x 10 Amp TP CB's

1 x 10 Amp TP CB's (Spare) Panel 7: PLC

1 No 10Amp SP CB (mains) 1 No PLC complete

1 No HMI

Set PLC fuses Set terminals

1 No PSU 230V-24V DC

Set Relays

1 No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

The cabinet shall be free standing having the same width and height as the MCC.

The PLC and HMI as described under the PLC instrumentation section and per the FDS and P&IDs and in accordance with Standard Industry Specification for Instrumentation shall be installed in the PLC cubicle. The PLC shall be complete including circuit breakers, PLC rack, PLC power supply, PLC controller, digital input/output modules, analogue modules and expansion modules with slots complete with associated terminals, blocks and fuses, and internal wiring. A managed switch with loop isolators, relay base, relays, fuses, terminals, etc. shall be included. The PLC software shall be programmed and shall include the automatic control and monitoring of the pumping systems.

Signals from the PLC shall be taken to the telemetry panel for signals to be transmitted to the main SCADA at the UGU Control Room. The SCADA is to be integrated and programmed with all the motor status, pages, trends etc from MCC PLC. The telemetry system is to form part of the electrical scope. The PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All pump/s status - run, stop , trip, overload , anti-single phasing etc All pumps e-stop

Suction sump levels Low level stop

No flow trip

The electrical contractor shall provide the final I/O lists for comments and approval

Controls :

All duty and duty-assist pumps are automatically controlled by the levels in the suction sump or manually and remotely controlled from the SCADA system. The duty and duty- assist pumps are to be controlled (stop and start) by level electrodes installed in the suction sump The levels shall be monitored by the level sensor in the suction sump. The pumps shall also be manually controlled with all protection in place. All pumps shall stop should there be a low level in the suction sump via level floats in the sump. A no flow switch on the delivery pipe shall trip all pumps should a no flow condition arise. The stand-by pump/s should automatically start should any of the duty or duty-assist pumps trip or fail.

The PLC shall be programmed to automatically rotate the pumps so that the run hours are similar

PS 5.5.14 DISTRIBUTION BOARDS & FAN CONTROL PANELS AND OTHER CONTROL PANELS

PS 5.5.14.1 DISTRIBUTION BOARDS

The following distribution boards as described shall be equipped and installed in positions shown on the drawings. The distribution boards are required in the MCC Buildings and Pump Stations. The DBs are to be outdoor weatherproof type with lockable doors and epoxy powder coated. The DBs will be on generator supply.

The DBs are to be equipped as follows:

1 No 40 Amp TP Amp Main Switch and busbars + earth bar 2 x 10 Amp DP CB (feed to extract fans)

3 x 15 Amp SP CB's (lights)

1 x 5 Amp SP CB (By-pass for external lights on photo cell) 1 x 60Amp/30mA earth leakage unit

1 x 24V DC power supply for instruments, sensors etc 2 x 20 Amp SP CB's(plugs)

1 X 30 Amp TP (welding socket) 2 x 10 Amp SP CB's

1 x 10 Amp SP CB's (Spare)

The DBs for the other structures and buildings are built into or forms part of their respective MCCs.

PS 5.5.15 LOCAL CONTROL PANELS

PS 5.5.15.1 LOCAL CONTROL PANELS (LCP) – GENERAL

Where required or specified , the Local Control Panels shall comply in all respects with the section on Low Voltage Distribution Boards and where applicable to the Standard Specifications for Instrument and Instrumentation Installation.

The local control panels shall be complete with control circuits and shall be suitable for the system fault levels as specified with a minimum fault level of 5kA.

The construction of the mixer and dosing pumps local control panels shall be in accordance with relevant codes and standards for hazardous locations.

The construction of the local control panels shall be in accordance with the following Codes and Standards as described in the specifications and requirements below.

- SANS 10108:2005
- SANS 60079-10:2005/IEC 60079-10:2002, IDT, Ed. 4
- SANS 60079-13:1982/IEC 60079-13:1982, IDT, Ed. 1
- SANS 60079-14:2003/IEC 60079-14:2002, IDT, Ed. 3
- SANS 60079-25:2003/IEC 60079-25:2003, IDT, Ed. 1
- SANS 60079-26:2007/IEC 60079-26:2006, IDT, Ed. 2
- SANS 60079-27:2006/IEC 60079-27:2005, IDT, Ed. 1

PS 5.5.15.2 LOCAL CONTROL PANELS (LCP) – CONSTRUCTION

The local dosing control panels where required are to be installed adjacent the dosing tanks or mixers, dosing pumps and other equipment and shall be of the following construction:

- - Colour: Light Orange, colour B26 of SANS 1091.
 - IP Rating: IP65
 - 3CR12 1,6mm sheeting
 - Ex Rated for PAC or other explosive or zoned rooms only

- Mounting: Free standing at 1000mm AFFL on P1000 supports
- With doors
- Gland Plates: Top & Bottom Entry

Equipment for the local control panels will be specified when the panels are required, currently they will be required under Phase 2 of the project.

PS 5.5.15.3 Surge Arrestors

Surge Arrestors conforming to Category III as per SANS 10142-1:2017, Table I.1.2 shall be installed after the main incomer circuit breaker of all MCCs and DBs.

The installation shall be executed as per SANS 10142-1:2017 Figure I.1.2 - Installation Mode of SPDs. shall be selected in accordance with the OEM recommendation for the arrestors provided.

Surge arrestors shall be fitted to all power and signal outgoing cables and feeders to field instruments and must be allowed in the pricing of all MCCs and distribution boards.

PS 5.5.15.4 Balancing of Load

The electrical contractor is required to balance the load as equally as possible over the multiphase supply, at each distribution board and motor control centre.

PS 9.6 CABLE RETICULATION SYSTEM PS 9.6.1 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 or 300mm below ground during backfilling. Standard concrete cable markers shall be installed as indicated on the drawings or as directed on site all to SABS Specifications.

All power cabling shall be fire resistant 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 and shall be 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, 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. Pratley glands are not preferred.

Cable tray shall be of the O-Line, Cabstrut or similar and equal approved and be 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. Cabstrut cable trays and ladders are preferred.

All trenches for low voltage and control cables are to be 600mm deep and 400mm wide.

Cable marking tape 300mm 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 exceeding 150mm. 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 no smaller than 10mm.

Installed cabling shall be made vandal proof which includes encasing the cables in concrete by the civil contractor where specified.

PS 9.6.1.1 CABING TO MCCs, DBs AND EQUIPMENT

All dosing pumps, mixers etc for the dosing systems and other equipment shall be fed from the Motor Control Centre Panel MCC01 located in the Chemical Dosing Building and the MCC02 located in the Sludge Press Building.

Cables for the raw water and clear water pumps, sludge pumps, water re-circulation pumps and filter back-wash pumps shall be fed from their respective MCC 03,04 , 05, 06 and from the existing high lift pumps MCC Cables will be located on cable trays for the dosing systems and other equipment. 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. The 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 drawing V02-124-01-010-DET-T-O1 for the new site electrical distribution system and cable reticulation. For other power cable requirements refer to the cable schedule in clause PS 9.6.1.3 below.

PS 9.6.1.2 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. Cables to remote or reservoir field devices shall be individually screened overall screened SWA cables.

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.

All instrument cabling shall be installed in conduits or sleeves and on cable tray as shown on the drawings.

Cable lengths shown are approximate only and must be measured or confirmed prior to ordering. Joints in cables will not be permitted.

Cables to reservoir sensors shall be installed in conduit built into the reservoir walls and slabs by the electrical contractor for security purposes. Exposed power cables in the ground shall be concreted over by the civil contractor as specified or required..

Power and signal cables to instruments at remote reservoir sites etc shall be from existing telemetry panels, DBs or MCCs.

Cabling to and from the MCC or PLC to the various instruments shall be terminated in CCC or similar and equal approved junction or termination boxes. The boxes shall be IP65 rated and be mounted on the wall or on hot dipped galvanized brackets installed adjacent the instruments that they will be connected to. The free issue of the cables supplied with the instruments shall be terminated in the junction boxes by the contractor. The cabling systems shall be installed in accordance with the requirements of the specification and cable schedule included elsewhere in this document.

Cables to external instruments such as the level sensors and flow meters shall be SWA type cables. Long distance signal cables to reservoir flow meters, actuators , level sensors etc shall have signal repeaters or signal boosters fitted as standard with these long cables so that the signal strength is not compromised or and that there are no interference in the signals.

PS 9.6.1.3 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. Actual lengths of cables installed shall be claimed for payment. 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.

Note each operating / safety device is to be supplied with a separate cable to a IP65 CCG box or weather-proof isolator at the device. Multi-core cables run to two or more devices will not be acceptable.

All cables are to be numbered according to the standard specification. Wiring colour codes must be adhered to in accordance with the standard specification. 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

Cable Ref	Cable Destination		Cable Type	Size and No.	Installation Method	Length m (1)
	From	To				

MARGATE WWTW :**PS 9.1.1.1 POWER CABLES**

Cable Ref	Cable Destination		Cable Type Size and No.	Installation Method	Length m (1)
	From	To			
E01	Ex Eskom Transformer / meter	Generator Control Panel	3x240mm ² x 4 Core ECC	Cable duct & ground	
E02	Generator Control Panel	MCC 01 Main LV Panel	3x240mm ² x 4 Core ECC	Cable duct & ground	
E03	MCC 01 Main LV Panel	MCC02	95mm ² x 4 Core ECC	Sleeves & ground	
E04	MCC 01 Main LV Panel	MCC03	35mm ² x 4 Core ECC	Sleeves & ground	
E05	MCC 01 Main LV Panel	MCC04	35mm ² x 4 Core ECC	Sleeves & ground	
E06	MCC 01 Main LV Panel	MCC05 (Future)	240mm ² x 4 Core ECC	Sleeves & ground	
E07	MCC 01 Main LV Panel	MCC06 (Ex Nursery Pumps)	25mm ² x 4- Core ECC	Sleeves & ground	
E08	MCC 01 Main LV Panel	Ex Admin/Offices	16mm ² x 4 Core ECC	Sleeves & ground	
E09	MCC 01 Main LV Panel	MCC07 Chlorine/Chemical Dosing	16mm ² x 4C ECC	Ground & sleeves	
E10	MCC07	Workshop DB	16mm ² x 4C ECC	Ground & sleeves	
E11	MCC01 & 02	All aerators 1 – 7 motor	10mm ² x 3C ECC	On cable tray & ground	
E11A	MCC01 & 02	Aerator 1 – 7 motor heaters	1.5mm ² x 3C ECC	On cable tray & ground	
E12	MCC01 & 02	Aerators 1 – 7 thermisters	1.5mm ² x 3C ECC	On cable tray & ground	
E13	MCC01 & 02	Aerators 1 – 7 stop locks	1.5mm ² x 3C ECC	On cable tray & ground	
E14	MCC 05	Blower motors (Future)	16 mm ² x 3C ECC	Cable tray	
E15	MCC (all)	All motor stop locks	1.5mm ² x 3C ECC	Cable tray	
E16	MCC (all)	All motor heaters	1.5mm ² x 3C ECC	Cable tray	
E17	MCC (all)	All motor thermisters	2.5mm ² x 3C ECC	On cable tray	
E18	MCC (all)	All motors up to 15kW	10mm ² x 3C ECC	On cable tray	
E19	MCC (all)	All motors up to 7,5kW	10mm ² x 3C ECC	On cable tray	
E20	MCC (all)	All motors up to 5,5kW & Inlet Works Screens etc	2.5mm ² x 3C ECC	On cable tray and ground	
E21	MCC 07	All Chemical and Chlorine Dosing Pumps & Equipment (Future)	2.5mm ² x 3C ECC	On cable tray	
Cable Ref	Cable Destination		Cable Type Size and No.	Installation Method	Length m (1)
	From	To			
E22	MCC (All)	Level electrodes and floats	2.5mm ² x 4C ECC	On cable tray	
E23	MCC (All)	Instruments/sensors/flow meters/flow switches etc	1,5 & 2,5mm ² x 4C ECC	On cable tray	
E24	MCC01	MCC-14 (Inlet Works TT3)	16mm ² x 4C ECC	Sleeves & ground	

SL	MCC (All)	Streetlights or floodlights or pole lights	4mm ² x 4C ECC	In ground and sleeves	
PUMP STATIONS:					
E25	Eskom meter panel (Sub)	Generator Panel Pump Station 4A	2x150mm ² x 4C ECC	Ground & sleeves	
E26	Generator Panel 4A	MCC09 Pump Station 4A	2x150mm ² x 4C ECC	Ground & sleeves	
E27	MCC09	110kW immersible pumps 1 - 3	95mm ² x 3C ECC	Cable tray	
E28	Eskom meter panel (Mini- Sub)	Generator Panel Pump Station 3A	2x150mm ² x 4C ECC	Ground & sleeves	
E29	Generator Panel 3A	MCC13 Pump Station 3A	2x150mm ² x 4C ECC	Ground & sleeves	
E30	MCC13	90kW immersible pumps 1 - 3	70mm ² x 3C ECC	Cable tray	
E31	Eskom meter panel	Generator Panel Pump Station 1A	35mm ² x 4C ECC	Ground & sleeves	
E32	Generator Panel 1A	MCC12 Pump Station 1A	35mm ² x 4C ECC	Ground & sleeves	
E33	MCC12	22kW immersible pumps 1 - 3	16mm ² x 3C ECC	Cable tray	
E34	Eskom meter panel	Generator Panel Pump Station 1	35mm ² x 4C ECC	Ground & sleeves	
E35	Generator Panel	MCC11 Pump Station 1	35mm ² x 4C ECC	Ground & sleeves	
E36	MCC11	22kW immersible pumps 1 - 3	16mm ² x 3C ECC	Cable tray	
E37	MCC (all)	All motor stop locks	1.5mm ² x 3C ECC	Cable tray	
E38	MCC (all)	All motor heaters	1.5mm ² x 3C ECC	Cable tray	
E39	MCC (all)	All motor thermisters	2.5mm ² x 3C ECC.	On cable tray	
E40	MCC (all)	All immersible motors oil contamination sensors	1.5mm ² x 3C ECC.	On cable tray	
PS 9.1.1.2 INSTRUMENTATION CABLES					
CC01	MCC PLC (All)	All sensors	1mm ² - 4 or 6C Twisted Pair Shielded	Cable tray and sleeves	Varies
CC02	MCC PLC (All)	Mag flow meters	1mm ² - 4 or 6C Twisted Pair Shielded	Cable tray and sleeves	Varies
CC03	MCC PLC (All)	Level sensor	1mm ² - 4 or 6C Twisted Pair Shielded	Cable tray	Varies
Cable Ref	Cable Destination From To		Cable Type Size and No.	Installation Method	Length m (1)
CC04	MCC PLC (All)	SCADA switch	Modbus , ethernet, fibre optic	Cable tray	Varies
CC05	MCC PLC (All)	All sensors, instruments etc	Decabond Instrument cable	Sleeves & cable tray	Varies

The contractor shall also be responsible to connect up and test the generator LV cables and control cables from the new generator control panel to the MCC panel. The cables will be supplied and installed under this contract.

Only SABS standard 1000 V fire retardant cable (Red Stripe) or approved equivalent by standard and make may be used on site.

PS 5.6.1.4.1 Installation of cables

The supply cable shall be installed:

- Along existing cable routes
- In a trench of minimum 500mm deep and 400 mm wide for LV cables and minimum 800mm deep for LV cables and
- Where entry into the pump station is required, cable shall be routed on cable ladders at low level only or as directed on site by the Engineer.

All surfaces shall be reinstated to their original state and to the satisfaction of the Engineer after installation of the cables.

PS 5.6.1.4.2 Cable Routes

The final position of the cables shall be determined on site prior to installation. All surfaces shall be reinstated to their original state and to the satisfaction of the Engineer after installation of the cable.

PS 5.6.1.4.3 Trenching

The contractor shall, before trenching commences, familiarize himself with the routes and site conditions. The procedure and order of doing the work shall be co-ordinated with the general construction programme.

The contractor will be held responsible for damage to any existing services brought to his attention by the relevant authorities and shall be responsible for the cost of repairs.

The contractor shall take all the necessary precautions and provide the necessary barriers, warning signs and/or lights to ensure that the public and/or employees on site are not endangered.

The contractor shall ensure that the excavations will not endanger existing structures, roads, railways, other site constructions or other property.

Trenches shall connect the points shown on the drawings in a straight line. The Engineer beforehand shall approve any deviations due to obstructions or existing services.

Trenches shall be as straight as possible and shall be excavated to a depth as indicated in this specification.

The excavated material shall be placed adjacent to each trench in such a manner as to prevent nuisance, interference or damage to adjacent drains, gateways, trenches, water furrows, other works, properties or traffic. Where this is not possible the excavated materials shall be removed from site and returned for back filling on completion of cable laying.

In the event of damage to other services or structures during trenching operations the contractor shall immediately notify the Engineer and institute repairs.

Prior to cable laying the trench shall be inspected thoroughly and all objects likely to cause damage to the cables either during or after laying shall be removed.

The contractor shall ensure that the excavations will not endanger existing building structures, roads, railways, or other site construction or other property before excavating.

Trenching crossing roads, footpaths or access ways shall not be left uncovered. If cables cannot be laid immediately, the contractor shall install sleeves or temporary "bridges" or cover plates, of sufficient strength to accommodate the traffic concerned.

The bottom of the trench shall be smooth and free of any sharp dips or rises which may cause tensile forces in the cable during backfilling.

PS 5.6.1.4.4 Cable protection and marking

The electrical contractor shall supply and install the following:

- After excavation clear all stones and rubble from the trench and backfilling material
- PVC cable marker tape, 300mm wide 300 mm below finished ground level
- Concrete cable route markers

PS 5.6.1.4.5 Labels

Stainless steel tags similar to the "DYMO" type shall be provided at each cable end, indicating the type, size and destination of the cables. All circuit breakers shall be provided with labels.

Labels shall be done with white Celeron with black lettering fastened with brass bolts and nuts, stainless steel self tapping screws or pop rivets.

Glued labels shall not be accepted.

The Engineer shall approve final wording of labels before ordering.

PS 5.6.1.4.6 Manholes

Manholes shall be constructed by the civil contractor in positions and as detailed and shown on the drawings.

The electrical contractor shall be in attendance and assist the civil contractor with construction of the manholes and placing of the sleeves.

PS 5.6.1.10 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.

PS 5.7 STAND-BY GENERATORS

The existing stand-by generators for the Margate Pump Stations 3A and 4A are to be refurbished, repaired and serviced to get them operational again and commissioned. Provisional sums are allowed for this work. The electrical contractor is to employ the services of a specialist or OEM to conduct a detailed assessment and report on the condition of the generators. A detailed breakdown cost is required for the repairs and refurbishment for the generators.

The existing generator for Pump Station 3A is a 500kVA canopy type and is installed on the existing pump station roof.

The existing generator for Pump Station 4A is rated at 500kVA and is an open set type and is installed in a generator room. A new generator room is to be constructed as the existing one is not easily accessible for maintenance and filling of fuel. The existing generator is to be serviced, repaired and refurbished and thereafter relocated to the new generator room, reconnected and re-commissioned.

The new generators are required for the Margate WWTW and the Margate Sewer Pump Stations 1 and Margate Pump Station 1A.

PS 5.7.1 Scope of Work

The scope of work shall comprise the following :

- Refurbishment of the existing generator, electrics and control panel for the existing Margate Sewer Pump Station 3 A & 4 A
- The supply and installation of one new canopy type generator with control panel installed in the existing Margate WWTW site rated at 650kVA
- The supply and installation of one new canopy type generator with control panel installed in the Existing Margate Sewer Pump Station 1 rated at 100kVA
- The supply and installation of one new canopy type generator with control panel installed in the Existing Margate Sewer Pump Station 1A rated at 100kVA
- Supply and installation of new LV cabling from the Eskom sub-station or meter panel to the new generators for Pump Stations 1 and 1A and to the new MCCs in the existing sewer pump stations
- Supply and installation of new LV cabling from the Eskom sub-station to the new generators for Pump Stations 3A and 4A and to the new MCCs in the existing sewer pump stations
- Trenching and backfilling of cable trenches
- All cable sleeves and ancillary work.

- Synchronization of the new and existing repaired generator sets and the existing mains supply by Specialist
- Re-programming of the existing Deap Sea or other generator controller by specialist
- Provide fuel for the testing and commissioning of all the generators
- Testing and commissioning of the new generators and control panel
- Testing and commissioning of the existing generators and control panel
- Provide O & M manuals for the new and existing generators

Exclusions :

- Supply and installation of new MV Switchgear and 11/22kV cabling from the MV terminals
- Fencing around the new generators (by civil contractor)
- Any civil and building works for the generator buildings or other civil requirements (if installed indoors, to be decided later)
- Concrete plinth for the new generators (by civil contractor)

PS 5.7.3 STAND-BY GENERATOR SPECIFICATIONS

A provisional sum has been allowed in the bill of quantities for the repairs, refurbishment and relocation of the two existing generators for the Margate Sewer Pumps Station 3A and 4A.

However, the new generators for the Margate WWTW and for the Margate Sewer Pumps Stations 1 & 1 A shall generally comply with the following specifications:

SECTION 1

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 5.7.3.1 Scope of Work

Supply, delivery and installation of the complete emergency stand-by diesel generator set as specified in this document. 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 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 3CR12 silent type canopy. Sound attenuation shall be provided for the set and the canopy with the noise levels kept to minimum decibel values.

Standard fittings shall include exhaust with residential silencer. The canopy container shall be fitted with air supply and exhaust louvres or grilles for the generator and radiator ventilation and cooling. The canopy shall be fitted with vandal proof locking mechanisms on the doors and other access points. The canopy shall be painted to a colour still be to decided. Details of the paint specifications shall be provided later. (epoxy powder coated dove grey or similar)

PS 5.7.3.2 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 5.7.3.3 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 5.7.3.4 Test Certificates and Inspections The following tests are to be carried out:

1. 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.
2. 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.
3. 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.

4. Test reports of both tests as specified under (a) and (b) are to be submitted to the Engineer/Consultant.

PS 5.7.3.5 Guarantee and Maintenance

The Contractor shall provide a warranty 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 warranty 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:

1. 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.
2. Grease and oil moving parts, where necessary.
3. Check the air filter and, when necessary, clean the filter and replace the filter and oil.
4. Check the lubricating oil and top-up when necessary.
5. 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.

1. 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.
2. Check and when necessary adjust the valve settings and the fuel injection Equipment.
3. Check the battery and top-up the electrolyte when necessary.
 1. 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.
4. 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.
5. Advise the Engineer/Consultant when it has become necessary to de-carbonize the engine and submit a quotation for this service.
6. Top up the water of the radiator, if applicable.
7. Clean the plant and its components.

PS 5.7.3.6 Material and Workmanship

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1. 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.
2. All work shall be executed in a first-class manner by a qualified tradesman.
3. 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
4. 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.

5. All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.
6. 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 5.7.3.7 Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents. PS

5.7.3.8 Submittals

The following information must accompany the tender documents

1. Full particulars, performance curves and illustrations of the equipment offered, must be submitted with the Tender.
2. The design of the control system to comply with the requirements for automatic starting, stopping, interlocking and isolation as specified.
3. 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 switch-gear and control gear. One diagram shall be contained in a metal pouch on

the side of the switchboard.

1. All civil and building requirements for the generators, container and step-up transformer

SECTION 2 – EQUIPMENT REQUIREMENTS**PS 5.7.3.9 Engine**

Perkins, Cummins, John Deere, VOLVO or SCANIA or other UK or USA manufactured diesel engines shall be provided. Preference will be given to engines that match the existing on site.

PS 5.7.3.9.1 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 5.7.3.9.2 Sound attenuation

Sound attenuation is to be supplied to attain a specification of NC 80dB at 10 meters. The color of louvres shall to be natural finish to match existing finishes.

PS 5.7.3.9.3 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 5.7.3.9.4 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 5.7.3.9.5 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 5.7.3.9.6 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, housed in a suitable battery box.

PS 5.7.3.5.7 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 5.7.3.9.8 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 5.7.3.9.9 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 5.7.3.5.10 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 5.7.3.5.10 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 $\pm 5\%$ at all loads, zero and rated load.

PS 5.7.3.5.11 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 5.7.3.9.12 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 expelled 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 5.7.3.9.13 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 5.7.3.10 Alternator

Alternator make shall be : Stamford, Moreli, Motori, Engga, Leroy Somer, Marathon or Maccallte. Preference will be given to alternators that match the existing two generators on site.

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 5.7.3.10.1 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 5.7.3.10.2 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 5.7.3.10.3 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 5.7.3.10.4 Synchronizing

The alternator must be fully setup and supplied with all equipment requiring for the synchronizing of the new and existing units and to the mains supply.

PS 5.7.3.10.5 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 5.7.3.11 Switchboard**PS 5.7.3.11.1 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 5.7.3.11.2 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 5.7.3 11.3 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 5.7.3 11.4 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 5.7.3.11 5 Switchboard Instruments The following are preferred:

Deepsea 8610, no other controller will be accepted. All protective circuit

breakers/ change over switches are to be Schneider or similar and equal approved by the Engineer.

PS 5.7.3.11.6 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 5.7.3.12. 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 5.7.3.13 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.

1. Unauthorised work on equipment prohibited.
2. Unauthorised handling of equipment prohibited.
3. Procedure in case of electric shock, electrical danger signage, warning machine starts automatically. no un-authorised entry signage shall be supplied and installed

The successful tenderer must consult the latest Occupational Health and regarding these warning 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 5.7.3.14 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 5.7.3.15 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 5.7.3.16 SECTION 3 – TECHNICAL SPECIFICATION

PS 5.7.3.16.1 General

Supply, deliver, install, test, commission and maintain an emergency generating set at Ulundi- WTW.

This installation must comply fully with all the sections and drawings of this document. This technical Specification is supplementary to the Equipment Requirements, Section 2, and must be read together. Where they are at variance the Technical Specification shall apply.

These sets are fully enclosed and synchronised during operation.. PS 5.7.3.16.2 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.

1. Height above sea level : 59 meter above sea level @ Margate
2. Maximum ambient temperature : 45°C

After the de-rating factors for the engine and generator due to site conditions have been taken into account, the sets must have a site output and voltage as follows: -

Margate WWTW Site :

No load voltage : 400/230 Volt

Rating 650kVA canopy unit

(Prime) Frequency 50Hz

Fault Level 15kA

Load Power Factor: : 0.8

Margate Sewer Pump Station 1 Site :

No load voltage : 400/230 Volt

Rating 100kVA canopy unit

(Prime) Frequency 50Hz

Fault Level 15kA

Load Power Factor: : 0.8

Margate Sewer Pump Station 1A Site :

No load voltage : 400/230 Volt

Rating 100kVA canopy unit

(Prime) Frequency 50Hz

Fault Level 15kA

Load Power Factor: : 0.8

Margate Sewer Pump Station 3A & 4A Sites :

No load voltage : 400/230 Volt

Rating 500kVA canopy unit (TBC)

(Prime) Frequency 50Hz

Fault Level 15Ka (TBC)

Load Power Factor:.....: 0.8 (TBC)

The generator output shall suit the starting and run load as per the load estimates below. The estimates may change slightly depending on the final selected pumps 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 combined existing and new generators shall be as follows :

Margate Sewer Pump Stations 1 :

Sewer pumps - 2 x 22kW VSD starters (1 duty , 1 stand-by) Lighting, fans and other loads - 7,5kW

Margate Sewer Pump Stations 1A :

Sewer pumps - 2 x 22kW VSD starters (1 duty , 1 duty assist) Lighting, fans and other loads - 7,5kW

Margate Sewer Pump Stations 3A :

Sewer pumps - 3 x 90kW VSD starters (1 duty , 1 duty assist, 1 stand-by) Lighting, fans and other loads - 7,5kW

Margate Sewer Pump Stations 4A :

Sewer pumps - 3 x 110kW VSD starters (1 duty , 1 duty assist, 1 stand-by) Lighting, fans and other loads - 7,5kW

Margate Waste Water Treatment Works (WWTW) :

Aerators - 7 x 30kW Soft Starters (7 duty)

Sludge Wasting & Recycle Pumps - 4 x 15kW VSD (2 duty , 2 stand-by) Sluice gate valve motors - 2 x 3kW DOL (2 x duty)

Sludge return pumps - 2 x 7,5kW VSD (1 duty , 1 stand-by)

Inlet Works Screen, Conveyor & Compactor - 5 x 4,5kW DOL (5 duty) Sedimentation/clarifier tanks bridge motors - 6 x 2,2kW DOL (6 duty) Air Blowers - 5 x 45kW VSD (4 duty , 1 stand-by) - Future

Backwash Pumps - 3 x 30kW (2 duty , 1 stand-by)

Chemical Dosing Equipment - 5 x 1.1kW (4 duty , 1 stand-by) Dewatering equipment - 1 x 5,5kW DOL (1 duty)

Other mechanical loads etc - 4 x 5.0kW (all duty) Fans - 8 x 1.1kW (all duty)

Instrumentation - 2kW Lighting - 15kW

Other Loads - 5kW

No two pumps in any one station will be able start or run simultaneously, inter-locking will be provided by the PLC or control system to enable this function. However they may start simultaneously with pumps in other stations.

PS 5.7.3.17 Switchboard/Control Panel Unit PS 5.7.3.17.1 General

All switch- and control gear shall be rated for a fault current levels of 15kA.

The switchboard shall be floor standing or plant or wall mounted type or installed within the generator canopy 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 5.7.3.17.2 AMF controller

A DSE8610 or similar approved 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 5.7.3.17.3 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-CEA" type generator control unit or similar approved 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. Fuel low level, battery voltage signals shall be wired to the MCC PLC or telemetry panel for relaying of these signals to the remote SCADA system at the UGU Control Room.

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, fuel level, mains and alternator voltage, phase currents and frequency. These signals shall also be relayed via telemetry systems to the remote SCADA system,

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 5.7.3.18 Regulations and Other Requirements

The installation shall be erected and tested in accordance with the following acts and regulations:

- 1. The latest issue of SABS 0142: "Code of practice for the wiring of premises."
 2. The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended.
 3. 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.
 4. The Fire Brigade Services Act 1993 Act 99 of 1987 as amended.
 5. The National Building Regulations and Buildings Standards Act 1977 (Act 103 of 1977) as amended
 6. The Post Office Act 1958 (Act 44 of 1958) as amended.
 7. The Electricity Act 1984 (Act 41 of 1984) as amended.

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 all the units.

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, AMF, control panel, controller etc set shall be provided with the tender or quote for evaluation purposes. The returnable data sheet shall be submitted with the quotations.

PS 5.7.3.19 GENERATOR DATA SHEET (TO BE COMPLETED AND SUBMITTED BY TENDERER - 1 FOR EACH SET) : COMPULSORY

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	GENSET RATINGS			
1,1	Generator continuous power rating	kVA	Refer load schedule	
1,2	Typical generator power output (COP)	kVA		
1,3	Typical generator power output (PRP)	kVA		
1,4	Typical generator power output (LTP)	kVA		

1,5	Alternator efficiency	%		
1,6	Load acceptance recovering time			
1,7	At 80% continuously power (COP)	sec		
1,8	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			
	DESCRIPTION	UNIT	SPECIFIED	OF-FERED
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		Leroy Somer or similar	
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	
5.10	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 CEA or similar	
10,5	Model of controller			
10,6	Remote monitoring	Yes/No		
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		
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		
	DESCRIPTION	UNIT	SPECIFIED	OF-FERED
12	OPERATING ENVIRONMENT			
12,1	Inland/Coastal		Coastal	
12,2	Inside /Outside		Outside	
12,3	Ingress Protection	IP		
12,4	Site Conditions - Altitude	m		
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	Yes	
13,2	Size of Dummy Load	% of Generator or Capacity	%	%

13,3	Positing in cowl	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 / SHIPPING CONTAINER		
17,1	Canopy / shipping container required	Yes (shipping container)	
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	Other details:		
18	SUPPLEMENTARY DETAILS		

A generator specialist shall be engaged to carry out the specialist work to supply and install the new generators and to synchronize the generators and to set up and program the generator DeepSea controller/s. They shall also re-test and re-commission the existing generators and the new generators.

PS 5.8 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 drawing is 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.

Lights and socket outlets shall be wired as follows:

Lights:	2.5mm ² including neutral & earth wires
Sockets:	4 mm ² including neutral & earth wires
Welding Plugs:	16mm ² 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.

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 x 30W LED ECG 1.5m 2 Tube corrosion resistant fluorescent fittings with polycarbonate diffusers and LED energy efficient lamps or similar and equal approved
Corrosive Process and Storage Areas, PAC & Chlorine Dosing Rooms	Type B	TLF- CRA /Z1/ 2 X 58W ECG 1.5m 2 Tube explosion proof zone 2 EXE fluorescent fittings and T5 energy efficient lamps or similar and equal approved
Passages / Ablution Areas	Type C	TLF - RDL/F/W / 18W LED GU10 Recessed aluminium white LED down-lights with LED Lamps or similar and equal approved
External Areas	Type D	TLF- LRBH /18W LED ECG Bulkhead wall external lights with LED lamps or similar and equal approved
Lights over filters	Type E	TLF- LFL/100W LED External Floodlights with 100W - LED lamps industrial type aluminium body corrosion resistant fitting with 50 x 150 x 42 adjustable bracket or similar and equal approved
External Areas	Type G	TLF- 9.5m mounting height (total 11m) hot dipped galvanised pole with base plate for site area floodlight or similar and equal approved
External Areas and Clarifier valve chamber	Type H	TLF - Floodlight over filters to match existing or similar approved (determine on site)
External areas - streetlights	Type J	TLF - LSL/100W LED ECG with 15deg mounting arm Streetlight with LED lamp and photo cell with nema base or similar and equal approved

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).

Special Requirements:

The electrical contractor shall only employ qualified personnel for EXE rated installations in areas such as the PAC Room and Chlorine Dosing Rooms and the installations shall be undertaken by qualified master electrician/s.

Site Lighting:

New poles and streetlight fittings are required to be installed as shown on drawing number MAR001- E-001. The fittings and poles shall be similar to what is existing on site where possible. The fittings required are TLF 100W LED or similar and equal approved with improved reflector and latest technology. The poles shall be 9.5m mounting height hot dipped galvanised type to match existing complete with 5 amp circuit breaker, photo cell 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. 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.

HPS lamps may not be used under any circumstances.

Excavation of the site lighting cable trench, laying of cable, compaction, backfill and making good of existing surfaces and removal of excess rubble shall be undertaken by the electrical contractor.

Note that street lighting shall be controlled VIA a day/night switch in the fitting or in a suitably sized weather-proof housing, all to be supplied and installed under this contract, and located as far as possible in a position unlikely to be vandalized.

In the pump station lighting is provided in the form of overhead and bulkhead type fittings. The contractor shall note that high and/or low level luminaires are to be mounted directly onto, or from, the roof trusses or slabs and structural steel columns at the heights and positions shown.

PS 5.9 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, SANS10292 (Earthing of LV distribution systems) and NRS076 (Earthing of distribution substations with nominal voltages up to 132kV) . 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 waterworks and pump stations are situated on the sites with the structures therein susceptible to damage from lightning strikes; therefore it 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 systems to be installed by a specialist contractor in this field :

Margate WWTW Site :

- All pump stations within the site
- All MCC Buildings within the site
- Main LV Substation Building
- Chlorine and Chemical Dosing Building
- TT1 & TT3 Inlet Works Structures
- Main Admin Building & Office
- Blower Room Building

Pump Stations :

- Margate sewer pump station 1
- Margate sewer pump station 1A
- Margate sewer pump station 3A
- Margate sewer pump station 4A

The existing waste waterworks buildings and sewer pump stations do not have existing lightning protection and earthing systems in place.

The existing and new buildings and structures will be provided with a Lightning Protection system comprising of a 70mm² bare copper trench ring main around the buildings or structures at a depth of 600mm and connected to a series of copper clad earth spikes driven vertically in the ground at a depth of 600mm, the quantity and spacing of which shall suit the ground resistivity survey and earth resistance required. The 70mm² PVC insulated earth wires shall be connected from the trench earth and installed up brickwork or concrete walls and columns for connection to the reinforcing steel in concrete floors and to roof sheeting and structural members where installed. Copper earth bushes shall be installed on concrete walls and columns etc for connection to the ring main and connected the reinforcing steel in the walls and columns. 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 25 x3 flat copper tape or 10mm dia solid aluminium conductor and connected to the reinforcing steel of the roof slabs at least to all corners of the buildings or structures. All steel handrailing and platforms shall be bonded to the earthing system. Steel columns and other steel members shall be bonded to the lightning protection system and be drilled and tapped to receive 70mm² terminations. All down conductors shall be 70 mm² PVC insulated earth conductors with a bolted connection,

installed in PVC conduit. Test points shall be installed in all down conductors. All earth conductor shall be concealed as far as possible and bult into slabs, walls etc.

A 300mm long copper earth bar on standoff insulators shall be installed adjacent all MCCs in positions as shown the drawings or as determined 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 on site for equipotential bonding.

The lightning protection and earthing installation for the various structures shall be undertaken by a specialist contractor as shown on the drawings per the attached drawing number list or schedule.

All test point, connections points and earth bars are to be labelled. All underground connections shall be exothermic welds.

The contractor shall carry out earth resistivity tests on the site of works and provide test result certificates together with recommendations of the installation to the Engineer.

The certificate of compliance shall be issued for each building or structure by an accredited person and the installation earthing shall have a maximum resistance of 2 ohms and / or lower. Should this figure not be achieved, then 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.

Surge suppression equipment shall be installed in all MCC's and distribution boards in accordance with SANS61312.

As built drawings shall be provided by the contractor on completion of the installation. The contractor shall comply with the designs and layout drawings as far as possible.

NB : A full time team shall be on site to install earth conductors that are required to be 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.

PS 5.10 INSTRUMENTATION, SCADA & PLC SYSTEM

PS 5.10.1 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.

PS 5.10.2 SCADA

The existing Water Treatment Works Control Room shall be supplied and installed with a new Control and Data Acquisition (SCADA) system which is used for the monitoring and partial control of the treatment and pumping process. A full SCADA system per the Client specifications is required to provide automatic control and monitoring information at the plant.

The proposed SCADA System extension is only allowed for the all new equipment for the proposed plant upgrade and new equipment.

The existing UGU SCADA system at the UGU Remote Control Room is to be upgraded for the new sites. A provisional sum is allowed for this work to expand and upgrade the existing system.

The new SCADA hardware will be rack mounted and installed in a suitable position in the Control Room. To include 6 x HMI outputs, 1 No PC monitor, and associated input equipment to be situated on the control desk. The SCADA system proposed is the Schneider Server Latest Version with 8-75 Scanned Points or similar and equal approved by the Employer's Representative or Engineer. The SCADA system will be provided to monitor and automatically control the entire treatment, process, pumping and dosing systems based on inputs received from water monitoring instruments. The full SCADA system integrates the total treatment, process, pumping and dosing systems and provides early warnings for critical elements to prevent damage to equipment and injury to personnel.

The SCADA system will be provided in the new Control Room and linked to the various components via data and instrumentation cabling. A computer system shall incorporate the SCADA software incorporating an overview of the entire water treatment process, pumping and dosing systems etc including screen pages and will

provide interlocks, trends, alarms and historical data of the system. The SCADA system will be linked to the proposed PLC systems in the following MCCs or buildings :

- MCC01 - Main LV Panel & TT1 Aerators
- MCC02 - Aerators & Clarifiers TT2
- MCC03 - Waste Recycle Pumps
- MCC04 - Sludge Return Pumps
- MCC08 - Sludge Dewatering Plant & Equipment (Future)
- MCC13 - TT3 Inlet Works Screens / Conveyor etc

PLCs will be installed under phase 2 for MCC05, 06 and 07 at the WWTW. Other PLCs will be installed under future phases of the project.

PLCs for the remote sewer pump stations 1 , 1A , 3A and 4A are to be installed in their respective MCCs.

The communication between the PLC to Scada shall be via Modbus or fibre optic and to be Ethernet enabled.

The standard viewing and basic control operator screens include:

- MAIN MENU
- SINGLE LINE DIAGRAMS
- PROCESS P&ID'S
- INSTRUMENT DATA AND STATUS
- INTERLOCKS
- TRENDING
- ALARMS
- EVENT LOG

The full requirements for the SCADA system shall be prepared and submitted in the FDS and P & IDs by the electrical and control panel builder contractor.

Full details and specifications for the SCADA system shall be submitted with the tender.

PS 5.10.3 PLC

The PLC system integrator must be a Recognized Certified Allen Bradley System Integrator or to suit any similar and equal approved PLC supplier. Proof of this must be submitted with the tender. The various PLCs shall be programmed by a specialist and a copy of the program shall be submitted and included in the hand-over documentation.

The PLC systems proposed shall be provided to convert all the data from the instruments, motor control and dosing systems and to communicate to the SCADA system. The PLC system for the Chemical Dosing System will be located next to the MCC01 panel in the Chemical building. The PLC are required in the following MCCs and buildings:

- MCC01 - Main LV Panel & TT1 Aerators
- MCC02 - Aerators & Clarifiers TT2
- MCC03 - Waste Recycle Pumps
- MCC04 - Sludge Return Pumps
- MCC08 - Sludge Dewatering Plant & Equipment (Future)
- MCC13 - TT3 Inlet Works Screens / Conveyor etc

HMI is only required in MCC01 (required for MCC05 for phase 2)

The PLC will act as an interface between the process components (e.g. Motors, valves, measuring instruments, etc.) and the SCADA system, and as such, will perform the following main tasks and have the following features:

- Process signal acquisition, Process signal output, and Process automation task, transfer of collected data to the monitoring and supervisory system.
- The Process signal acquisition and output shall be by means of suitable signal formation modules for both digital and analogue values.

CONSTRUCTION

The PLC shall be of the Allen Bradley Rockwell Compact Logic type 15000 series, Siemens S7 or equivalent and similar approved by the Employer's Representative or Engineer and be in accordance with the latest version of the Industry Standards for Instrumentation. All equipment to be housed in IP65 Orange or Grey Enclosure with door mount HMI based on new ICASA specifications and where specified are required to be large enough to house a 3kVA single phase UPS. Where required there will be approximately 8 x VSD outputs, with I/O modules having fused terminal blocks. Communication shall be Ethernet. Latest versions of Allen Bradley or Siemens HMI's compatible with the above PLC's and in accordance with industry standards shall be

installed in the door of the PLC panel for the above mentioned MCCs. Full details of the PLC operating and control philosophy shall be prepared and submitted with the necessary relevant FDS and P&ID's by the electrical contractor and control panel builder.

PUMP STATION INSTRUMENTATION SYSTEM

The required PLC & instrumentation equipment indicated on the P&IDs & FDS drawings to be prepared by the control panel builder will control the entire water treatment and pumping systems and linked to the SCADA to control and monitor the system.

All new instruments are proposed to be tied into the SCADA system at the Control Room.

GENERAL:

The SCADA AND PLC system shall include for all hardware, software engineering system design, programming, layouts, screen pages and wiring drawings etc complete in all respects. Full details of the system shall be provided with the tender offer. The programming shall be undertaken by a specialist system integrator who is qualified and experienced with the hardware and software for the Allen Bradley equipment supplied.

A provisional sum has been allowed in the contract for a new SCADA system and PLCs to be-programming by a specialist system integrator.

DEMCO Engineering in Durban shall be approached to provide a proposal for this work for the supply of all equipment, integration and automation.

PS 5.10.4 TELEMETRY

The various outstations and MCCs on site at the WWTW works and the remote sewer pump stations are installed with existing telemetry equipment communicating with the main master station in the existing UGU Control Room telemetry system. The telemetry systems are outdated, are missing/vandalised and do not work and is to be replaced. The telemetry in turn communicates with the existing SCADA and sends signals to the Control Room. The existing telemetry system are as supplied and installed by a specialist to UGU standards and requirements. The specifications and type of new telemetry equipment is to be determined by the telemetry contractor.

The existing master station is capable of handling up to two hundred (250) TRUs per communication medium. Each RTU is capable of being expanded to cater for the following input and output functions:

1. Analogue inputs expandable to a minimum of thirty-two inputs
2. Digital inputs expandable to a minimum of ninety-six inputs
3. Digital outputs expandable to a minimum of sixteen outputs

The system is a modular based design. The various outstation hardware must be automatically catered for any additional input and output modules.

A provisional sum is allowed in the contract for the upgrade and for additional input/outputs for the new sites or equipment and re-programming of the existing telemetry system to be undertaken by a specialist to interface with the current UGU WWTW system and UGU Control Room. All work shall be undertaken in accordance with the Clients Standard Specifications for Instrumentation or to industry standards.

Telemetry systems are required for the following sites for communication to the main SCADA system at the UGU Control Room :

- Margate WWTW
- Margate Sewer Pump Station 1
- Margate Sewer Pump Station 1A
- Margate Sewer Pump Station 3A
- Margate Sewer Pump Station 3B

Each telemetry system to include the following, and not limited to :

- Telemetry panel
- RTU radios
- Batteries
- Onmi directional Webb antennae
- GSM Module
- Modem
- Power supply and connection to 230Volt supply
- Earthing
- Surge protection

- Intruder alarm
- Stainless steel housing and mounting brackets etc
- All coaxial, signal and communication cabling and supporting equipment
- All other hardware and software for a full working installation as ready for use
- OPC / SCADA configuration and integration
- Testing and commissioning
- O & M manuals

The telemetry contractor shall provide all details and specifications of the telemetry equipment including wiring diagrams, GA layouts, loop and cable block diagrams, instrument diagrams, P & ID diagrams, I/O Lists, software programme etc complete.

PS 5.10.5 PARTICULAR SPECIFICATION FOR ULTRASONIC LEVEL TRANSMITTERS & INSTRUMENTS

The following level transmitters and their positions are required on this project:

Instrument Ref No	Item	Sensor Location	Description/Principle	Quantity	Pipe diameter (mm)	Function	Transmitter Location	PLC/SCADA	Drawing No.
IN-A14-LV-003	Level Sensor 1	Aerator Basin TT1	Ultrasonic %/m	1	n/a	Level monitoring, low level dosing pump trip	MCC-01	Y	N/A
IN-A14-LV-004	Level Sensor 24	Aerator Basin TT2	Ultrasonic %/m	1	n/a	Level monitoring, low level dosing pump trip	MCC-01	Y	N/A

The transmitters shall be installed inside the relevant MCCs (motor control centres) or in separate panel with a viewing window adjacent the MCC, refer to the schematic single line diagrams of the motor control centres and distribution boards or as described under the MCC specifications.

SPECIFICATION FOR LEVEL TRANSMITTERS & SENSOR INSTRUMENTS

Each set of the transmitter and sensor shall comprise the following 4 items below :

Item 1 - IFM or similar and equal approved UIT507 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,

Item 2 - IFM or similar and equal approved E10737 angle bracket,

Item 3 - IFM or similar and equal approved EVC087 connecting cable with socket;

Operating voltage < 250 V AC; 20 m; PUR; housing materials housing: TPU orange; Sealing: FKM; IP 65; IP 67; IP 68; IP 69K; Free from silicone ; Halogen-free ; Gold-plated contacts

Item 4 – IFM or similar and equal approved DX2042 Digital display; Operating voltage 115...230 AC / 18...30 DC; Number of digital outputs 4; with terminals,

Generally, the level sensors shall comply with the requirements of Client's standard specification included elsewhere in this document or as specified and to the approval of the Ulundi WTW operations standards and the Engineer.

The make and model of the transmitter and transducer shall be the IFM or similar and equal approved (0-8m Range) including mounting brackets, mounting arms and all other necessary accessories. The positions of the transmitters are shown on the drawings. The level sensor shall be used for monitoring of the levels of each reservoir, sump or channel to be transmitted via signal cable to the SCADA system. The shall be also used for the starting and stopping of the pumps and chemical dosing pumps and rate of the dosing system.

Transducers General

Suitable support brackets shall be supplied for all types of ultrasonic transducers. Coatings shall be applied to exposed surfaces that may be subject to damage from the process. Alternative mounting methods (e.g.: suspension) may be required in some applications.

Design :

Process Connection: Flange mounting, or to suit

Enclosure: IP55

Membrane: Stainless Steel

Electrical Connection: 20mm ISO conduit

Max Operating Temperature: 70°C Transmitter

General

Transmitter shall comprise of a remote electronics unit and a single field mounted ultrasonic transducer.

Preference shall be given to a unit where configuration, calibration, echo signal and diagnostic checking can be performed via laptop. The transmitter must display volume and be configurable via keypad. There must be at least 3 relay output and an analogue 4 to 20 Ma output. The unit must have the data logging capability. The transmitter shall have the ability to linearize the O/P depending on the geometry of the vessel, and thus relate

O/P to either level or volume. The ability of the system to visually analyse and configured to ignore unwanted signals from obstructions or agitators is essential. The transmitter shall have the ability to linearize the O/P depending on the geometry of the vessel, and thus relate O/P to either level or volume. The ability of the system to be configured to ignore unwanted signals from obstructions or agitators is essential.

Design :

Enclosure: To suit application

Output: 4-20 Ma into 250Ω load

Power Supply: 24 V DC

Calibration Adjustments: Independent for Zero & span Performance

Accuracy: 1 % of span or better

Repeatability: 0.2 % of span

Dead Band: < 0.2 % of span

Ambient Temperature Effect: < 0.5 % of maximum span per 10°C change

PS 5.10.6 PEPPER SPRAY & CCTV CAMERA SYSTEM PS 5.10.6.1 PEPPER SPRAY SYSTEM

Pepper spray also known as OC spray is a non-lethal chemical compound that causes irritation to the eyes leading to pain, tears and temporary blindness due to inflammatory effects. The gas is to be installed in gas cannisters within the pump station.

The main pump rooms and MCC rooms are to be protected. The pepper gas requirements and any pipework required together with their positioning and quantity of all motion sensors etc shall be determined by the tenderer. No claims for additional work will be entertained due to lack of information or uncertainty of site conditions. It must be noted that the pepper systems are to be installed in existing pump stations, so it is highly recommended the tenderers visit the four sites before submitting their tenders.

The pepper spray system consists of a pepper spray unit which is to be installed in each of the four pump stations namely Margate 1 , 1 A , 3A & 4A.

The system shall comprise the following as a standard, but the final selection of all equipment rests with the tenderer :

- Passive control card 250g cannister or equivalent
- Button code hopping remote and AC or DC power supply
- Built-in code hopping receiver for up to 16 remotes
- On-off input for key switch keypad receiver or other switching devices
- Normally open panic input for siren activation only
- Potential free alarm relay output NO/NC
- Potential to connect up to 3 pepper spray gas slave units
- Pepper gas alarm slave unit 12V DC
- Trigger input (from master unit)
- Selectable trigger delay 30sec via jumper
- 250g pepper spray cannister/s (or as determined by supplier)

The pepper spray is released when the infrared eye sensor detects movement making access to the immediate area within the pump station impossible. It serves as a delay mechanism during a burglary and will ensure that no equipment can be removed due to the presence of pepper spray until a response unit is dispatched and arrives on the scene.

The system is activated by remote control. The system is equipped with motion sensors and will activate an audible alarm should motion detection be triggered. The spray shall incapacitate an intruder/s for up to an hour where it will not be possible for the intruder to remain in the room when the system has been triggered. The system shall be controlled by an industrial type PLC controller and alarm system via the on-board output, and integrated to the MCC PLC and on site alarm system. In addition, signals shall also be transmitted to the SCADA system at the UGU Control Room via telemetry and GSM systems. The system can be a stand-alone master unit or can be incorporated as slave units.

The system shall be powered by 230Volt power supply and have built-in 7Ah battery back up for 48 hours for mains power failure.

In addition the system shall be connected to an on-board GSM commander unit that will immediately notify various parties of the attempted burglary. The GSM commander shall be programmed to detect low pepper spray levels, power outages etc. The following notifications shall be sent:

- System armed
- System disarmed
- System activation
- Mains fail
- Low battery
- Pepper gas cannister low

Full details of the complete pepper spray system shall be submitted with the tender including brochures and literature of all equipment required. Calculations for the system including gas quantity calculations, spray pattern etc shall be submitted at the time of tender. The system shall be complete in all respects as ready for use.

The system shall be tested and commissioned and full data sheets provided. Four copies of the O & M manuals in both hard and soft copies are to be submitted.

The necessary signage, danger and warning signs etc shall be installed as per legislation.

The entire pepper spray system shall be designed, supplied and installed in accordance with SANS, BS, IEC or ISO codes and regulations.

PS 5.10.6.2 CCTV CAMERA SYSTEM

In addition to the above pepper spray system, CCTC camera systems are to be installed for the four pump stations as follows :

- Margate Sewer Pump Station 1
- Margate Sewer Pump Station 1A
- Margate Sewer Pump Station 3A
- Margate Sewer Pump Station 4A

High resolution cameras are to be installed outside the entrances to all pump stations and also internally at the entrances. Cameras are to cover the entire pump station site externally and all around. The cameras are to be industrial grade outdoor weatherproof type and have night vision viewing and recording facilities and capability.

The system shall comprise the following :

- IP enabled cameras with stainless steel brackets and supporting material (quantity and positions to be determined by tenderer)
- DVR and recording unit
- Power supply with battery back up
- Monitor / viewing screen
- Router
- Facilities for remote Client viewing and recording
- Facilities for remote storage
- All cabling, conduits and other hardware required
- All software required

The CCTV system shall be controlled by an industrial type controller and alarm system via the on-board output, and integrated to the MCC PLC and on-site alarm system. In addition, signals shall also be transmitted to the SCADA system at the UGU Control Room via telemetry and GSM systems. The system must be able to view remotely and also record and store all footages at the remote SCADA system.

All hardware and software required must form part of the scope of work.

The CCTV camera system requirements together with positioning and quantity of all cameras, motion sensors etc shall be determined by the tenderer. No claims for additional work will be entertained due to lack of information or uncertainty of site conditions. It must be noted that the CCTV camera systems are to be installed in existing pump stations, so it is highly recommended the tenderers visit the four sites before submitting their tenders.

Full details of the CCTV camera system shall be submitted with the tender including brochures and literature of all equipment required. A layout of the positions for the cameras and other equipment must also be submitted with the tender.

The system shall be tested and commissioned and full data sheets provided. Four copies of the O & M manuals in both hard and soft copies are to be submitted.

The necessary signage, danger and warning signs etc shall be installed as per legislation.

The entire CCTV camera system shall be designed, supplied and installed in accordance with SANS, BS, IEC or ISO codes and regulations.

PS 5.10.7 DISSOLVED OXYGEN (DO) SENSORS AND CONTROLLER

Dissolved oxygen sensors shall be Hach LDO type or similar and equal approved for automatic control of the aertors.

It shall have automatic flushing of sensor and cable for minimum maintenance. The equipment shall be reliable with contactless signal transmission from sensor to main unit via an optical transmission system. All equipment shall have stainless steel housings and mounting brackets

Converter / Transmitter

- Housing: Field housing stainless steel 1.4301
- Housing material: Stainless steel 1.4301
- Protection class:

- IP 68 (sensor)
- IP 54 (electronic compartment)
- IP 44 (cable drum compartment)
- Ambient/process temperature:
 - -20...+50°C / -4...+122°F (whole system)
 - 0...+60°C / +32...+140°F (sensor)
- Display: Backlight graphic display 128 x 64 pixels
- Measuring: TSS = 0.1...30 g/l (depending on the sludge type) Height / depth 0...10 m
- Current outputs: 2 x 0/4...20 mA, galvanic isolated from power supply, active mode
- Control inputs: 3 x Control inputs
- Relays: 2 x free programmable
- Power supply: 230 VAC (-15% / +10%) at 50 Hz (±10%)
- Sensor cleaning / cable scraper: Without
- Installation: Handrail mounting set for round handrails OR mounted on aeration bridge with mounting brackets
- Transmitter cabling - 20m free issue
- Operation language: English

The sensor / controller shall be linked to a PLC which will automatically start and stop the aerators in the aeration basins depending on the dissolved oxygen concentration and levels in the basins. The automation shall be a function of the programming in the PLC by a specialist.

PS 5.10.8 MAG FLOW METERS

Outdoor type IP67 rated mag flow meters are required as follows suitable for installation on raw sewage pumping pipelines :

Instrument Ref No	Item	Instrument Location	Description/Principle	Quantity	Pipe diameter (mm)	Function	PLC/ SCADA
FM-0001	Flow meter 1 – Sludge Return Pumps	MCC	Electronic/flow	1 DN 200	Remote flow monitoring from SCADA + local		Y
FM-002	Flow meter – 2 Sludge Recycle Pumps	MCC	Electronic/flow	1 DN 200	Remote flow monitoring from SCADA + local		Y
FM-003	Flow meter – 3 Sludge Return Pumps	MCC	Electronic/flow	1 DN 250	Remote flow monitoring from SCADA + local		Y
FM-004	Flow Meter – 4 Sludge Recycle Pumps	MCC	Electronic/flow	1 DN 250	Remote flow monitoring from SCADA + local		Y

The positions for the meters and on which pumping or gravity mains they are to be installed are still to be determined.

The mag flow meters shall be set up, 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.

PS 5.10.8.1 Electromagnetic flowmeter for DN200 & DN250 for completely filled sewer pipelines

For completely filled pipelines with "pulsed DC field". Measurement is unaffected by pressure, density, viscosity, conductivity (> 1 µS/cm for liquids other than water; > 20 µS/cm for water), 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 (Accuracy of the test stand is 3 times better than the accuracy of the device under test).

Length of the sensor as per DIN and/or ISO 13359. Fully welded steel-plated coil housing, protective paint.

Supplied complete with earthing rings.

Up to 20 hours of factory sensor function/quality control in climatic exposure test cabinet. Featuring diagnostics functions according to VDI/VDE/NAMUR guideline 2650, ie. automatic monitoring of operating condition of complete device, installation conditions and medium.

The flow meters are to be suitable for measuring of raw sewage.

- Bi-directional flow measurement
- Including calibration certificate

- Measuring tube liner: PFA, pure transparent PFA, no filler, non-stick surface, vacuum resistant with reinforced stainless steel mesh
- Process temperature: -40...+180°C | +40...+356°F
- Nominal size: DN 200 & DN250
- DN 200 & DN250= Pressure stage PN 16
- Measuring electrodes: Hastelloy C
- Flange material: polyurethane-coated carbon steel
- Max. operating flow:
- Measuring accuracy: ± 0.2 % of measured value ± 1 mm/s
- Idling detection-warning: Idling detection standard
- Including diagnostic functions:
 - Conductivity measurement
 - Detection of electrode deposits/corrosion
 - Temperature display
 - Detection of gas bubbles/solids
 - Accuracy check
 - Partial fill detection
 - Checking of flow profile
- Includes integrated temperature and conductivity measurement
- LCD display - 2 measured value sides, 1 status side, 1 graphic side, operation using optical keys
- Ex approval: None
- Approved for custody transfer: None
- Auxiliary power: 85-250 V AC
- Signal outputs/communication: 1 x 4...20 mA HART, impulse/frequency output, status output, control input, galvanically separate
- Design: Separate design, Polyamide polycarbonate wall-mount housing
- Cable connection: M20 x 1.5
- Sensor cable/converter: standard length 5m | 16.4ft. Required length will be 100m for this project.
- 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: KROHNE OPTIFLUX 4300 W DN200 & DN250 PN16 or similar and equal approved. To be supplied complete with earthing rings.

Supplier of flow meter is to attend site to set up the meter and test and commission them. PS 5.10.8.2 Electro-magnetic flowmeter for DN200 & DN250 completely filled pipelines PS 5.10.11 UPS & UPS DB

PS 5.10.8 UPS & UPS DB

PS 5.10.8.1 UPS

The UPS shall be rated at 3 KVA 230 volts transformer on-line true sine wave type with battery pack-up for 15 minutes shall be supplied for the power supply to the PLC cabinet. The UPS shall be used to supply power to the SCADA/PLC cabinet as a back-up. The UPS shall be self-ventilating to operate in the temperature limits specified. The UPS shall be capable of maintaining the specified output for input variations with voltage of 230 V AC $\pm 20\%$ and frequency of 46-54HZ variations. The output voltage shall be 230 VAC $\pm 1\%$ over the steady state load range with an output frequency of 50hz $\pm 2\%$ operating at an ambient temperature of 0-45 degrees Celsius. The static switch shall have a no-break condition. The UPS shall be ICASA approved and not cause interferences with any electronic or other devices. Batteries shall be maintenance free lithium type.

The UPS cabinet shall be installed in the MCC Room PLC cabinet or externally adjacent. The UPS shall be supplied off a 230volts electrical isolator provided by the electrical contractor and the output shall be wired to an UPS DB to be supplied by the electrical contractor. The UPS shall be designed, manufactured, supplied and installed in accordance with the requirement of the relevant SANS or BS standards and in accordance with the requirements of industry standard specifications.

Full technical details and literature of the UPS proposed shall be supplied with the tender. Failure to do so may disqualify the tender.

PS 5.10.8.2 UPS DB 01

Supply, install, connect up, commission and test the following sub- distribution board including their associated supply and sub- circuits, cables, cable glands and accessories as required for a complete working installation.

The UPS DB shall be surface mounted with lockable door and shall be installed in the positions as shown on the drawings or as indicated on site by the Employer's Representative or Engineer. The DB shall be constructed and equipped as detailed below:

- 1 No 40 Amp DP Main switch
- 1 No DP surge arrester
- 4 x 10 Amp SP circuit breakers
- Terminal blocks as required

PS 5.11 OTHER INSTRUMENTATION

a) Pressure Transducer

Pressure transducer where specified and required are to be mounted on the delivery main in the pump station and shall be the type IFM, 0-25 bar 4-20mA loop powered (2 wire) unit supplied complete with a PTFE pressure washer. The max pressure setting will be given to the contractor prior to ordering of the unit/s. The pressure shall be displayed in the MCC by a suitable pressure controller/display. The contractor is to obtain prior approval if he intends using a transducer from another supplier.

b) Pump Casing Temperature Transducer (Supplied with Pump)

IFM or other approved motor PT100 thermistors (one per phase) including their corresponding controllers shall be supplied with the pumps where specified. The installation of the controllers and wiring and in the MCC shall be undertaken by the electrical contractor.

c) No Flow Switch

Where specified, an IFM (or equal and equal approved) flow switch shall also be installed on the delivery line of the discharge of the pumps. An ½ inch BSP socket shall be welded on the pipework for this. The controller shall be installed and wired in the MCC for the no flow protection. These switches shall be used for raw or clear water pumps. IMF flow switches are preferred.

Electronic flow switches are required for the no flow sensing and pump shutdown and shall be installed on the delivery side of the pumps in positions shown on the drawings or as determined later.

The sensors shall be installed in ½ inch BSP sockets welded to the pumps suction pipes in position shown on the drawings.

A flow sensor should be mounted on the suction of the pump to indicate the presence of flow. It should work on a calometric principle and have a local indication of the presence of flow as well as a 24VDC digital output to the control system. This signal should be interlocked with the pump. The sensor should be a probe type with installation via a ½" socket connection

Specification:

Flow sensor: PNP/NPN/analogue signal: Insertion depth 100mm; Voltage 24VDC; medium temperature -20 to 100deg; medium pressure 20bar. The switches shall be type IFM SA Part Numbers SA4300 and E40258 or similar and equal approved

Paddle type no-flow switches shall be used for very dirty raw water or sewage and de-sludge water pumping systems.

d) 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. Level electrodes shall be used

for the starting and stopping of the pumps. The lengths of the electrodes and number of electrodes shall be determined later but is generally about 5m long to bottom of sump. Level electrodes shall be stainless steel type with stainless steel mounting brackets. The level electrodes shall be installed in a stainless steel pipe to prevent the electrodes from being submerged by raw sewage.

Solenoid Operated Switches & Solenoid Valves

Solenoid switches shall be supplied and installed in positions shown on the drawings or as directed on site.

The solenoid operated valves shall be type Bürket or similar and equal approved. The valves required with their positions will be as determined later.

PS 5.11 MECHANICAL

PS 5.11.1 AIR-CONDITIONING AND VENTILATION INSTALLATION

The air-conditioning and ventilation installation are as shown on the drawings or as directed by the Engineer on site where no drawing exists. The installation shall comprise of the following:

- 1. Extract fans wall or cladding mounted in existing pump stations or chemical dosing building
 2. Split type air-conditioning units in existing Admin Building and Offices

The capacities and specifications for the fans and aircon units are as per the bill of quantities.

PS 5.11.2 SPLIT TYPE AIRCOOLED AIRCONDITIONING UNITS

The offices in the new Administration Building shall be equipped with mid-wall split air-cooled Air-conditioning units are as shown on drawing or as directed by the Engineer on site where no drawing exists.

The outdoor condensing units of the split A/C system shall be mounted on galvanized supports and installed on concrete plinths to be provided by the builder. Workshop drawings will have to be supplied by the Aircon subcontractor for adequate support of the units with suitable feet so as to not damage the waterproofing membrane.

Each air handling unit shall be complete with multi-vane centrifugal air-recirculation fan, cooling coil condensate tray, air filter, adjustable front discharge grill. Air filters shall comply with ASHRAE Test Standard 52-76 and they shall be the renewable or serviceable type and shall be fitted to all types of evaporator indoor units.

Each condensing unit shall be equipped with sealed compressor, air cooled condenser and shall be mounted on a heavy gauge steel base pan. Provision shall be made to prevent liquid refrigerant feed back to the compressor. Oil traps shall be provided where condenser units are mounted at high level above air handlers.

The air handling unit shall be in-ceiling ducted, ceiling cassette or wall mounted as indicated on the drawings.

All units shall be supplied in an attractive finish. The indoor and outdoor units including coils and fins shall be treated for corrosion using "Bluechem" or similar treatment.

Copper tubing and electrical cables, between the air handling units and condensing units shall be installed in accordance with the supplier's recommendations. Provision shall be made for wall sleeves or cores for the piping.

Each unit shall further be provided with a 12mm or 15mm copper or PVC drainpipe. These drainpipes shall terminate in the nearest gully, drain or waste which will be determined later during construction.

All piping and cables against the outside walls shall be covered with adequately sized PVC trunking. Colour of the trunking shall be confirmed with the Employer's Representative prior to ordering and installation.

All refrigerant suction lines shall be insulated with 10mm Armaflex or Thermaflex type 33 SE periodically improved (crossed linked) polyethylene foam tube insulation with quick zip fastener or any other similar approved method.

All units shall be supplied complete with remote or hard-wired temperature controller as indicated in the drawings or bills of quantities. Each room or zone shall have its own remote controller.

PS 5.12 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 or Pump Station discharging to the outside air or atmosphere. The specifications of fan systems where required are shown on the bill of quantities. 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.

The specification of the fans can be found in the bill of quantities.

Air intake louvres or grilles shall be provided by the civil contractor

Openings for fans in brickwork and roof or side sheeting shall be provided by the civil contractor including any weather louvres etc. Moulding frames and flashing for fans in roof sheeting or side cladding shall be provided by the contractor.

PS 5.13. 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.
- 30m Fire hose reels and pipework
- 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.

PS 5.14 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 and a sign on the outside of the door shall read "UNAUTHORISED ENTRY NOT PERMITTED"

"WARNING ELECTRICITY DANGER" signs & "MACHINE STARTS AUTOMATICALLY DANGER" signs shall be installed at all pump stations and other buildings.

Hazardous chemical signs shall be installed in chemical dosing rooms etc.

A label or sign no smaller than 80mm high shall be mounted adjacent to each pump to identify it as a "PUMP 1" or "PUMP 2". This can be vehicle number plate type signs

PS 5.15 ELECTRIC MOTORS

All LV electric motors shall comply with the requirements as per the Standard Specifications or as specified under the mechanical specification for pumps or other mechanical plant.

Motors above 7,5kW shall be fitted with anti-condensate heaters. Motors above 11kW 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.

All motors and especially those above 7,5kW shall be premium efficiency IE3 standard.

Refer to the Standard Specifications included elsewhere in this document for the full details and specifications for motors for this project.

PS 5.15 MAIN SWITCHBOARD AND MOTOR CONTROL CENTRE

PS 5.15.1 General

All switchboards shall comply with the requirements of the Particular Specifications.

The switchboard shall be of the free standing or wall mounted type, be provided with lockable doors and labels and installed in position as shown on the drawings. The final position of switchboards shall be determined on site.

Manufacturer's drawings of all distribution boards showing details of the type, size, material thickness, door type, finish, shall be submitted by the electrical contractor to the Engineer for approval before commencement of manufacture of the boards.

All distribution boards shall have 30 % spare space for future extensions.

PS 5.15.2 Construction Standard

Notwithstanding any other consideration, the main distribution panel shall be constructed, tested and certified for compliance with SANS/IEC 62439 and IEC/TR 60641 Internal Arc Certification.

The required performance certification shall be Class A, FLR 15 kA 300 ms.

PS 5.15.2 Selection of Switchgear

All switchgear shall comply with the applicable SANS/IEC standards for application at 400 V, 15 kA in a solidly earthed network.

Type 2 performance is required.

PS 5.15.3 Setting out of Switchboard

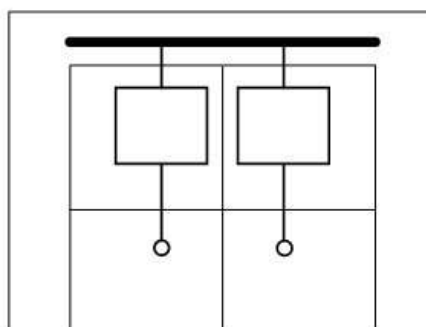
The Assemblies to be provided against this specification shall be metal-clad, fully enclosed low voltage switchgear as required for application as a Motor Control Centre and Distribution Switchboard.

Assemblies shall be of Type Tested pattern to IEC 61439-1 for the operational conditions as specified for the Supply Voltages and Frequency.

Where sections have been designated as "Future" in the single line diagram or equipment schedule, the circuit breaker position in the affected tier shall be fabricated such that retrofitting a future functional unit may be done with minimal.

PS 5.15.4 Form of Internal Separation

The required form of internal separation is Form 4b



Form 4b:
Terminals not in same compartment
as associated functional unit

PS 5.15.5 Busbar rating

The assembly main busbar shall be rated across its full length for the incomer current carrying capacity.

PS 5.15.6 Arc-flash Mitigation

Switchgear construction shall allow opening of the breakers with the door of the compartment closed to reduce arc flash hazards.

Vendor shall declare the arc-flash boundary applicable to his scope of supply with tender and shall quantify the PPE requirements that will apply.

Where interventions equivalent to IEC 62771-200, internal arc containment to A-FLR-15 kA 300 msec have been tested and implemented by Vendor this shall be declared.

PS 5.15.7 Busbars

The busbars shall be fully insulated and rated at least for the continuous ampacity rating of each type of switchgear and for a 40°C ambient temperature and shall be made from high conductivity hard drawn tin plated copper. The maximum hot spot temperature rise shall not exceed 65°C.

The insulators supporting and spacing the power busses shall be sufficient in number to support, without deformation, the electrodynamic stresses resulting from a current equal to the full asymmetrical current (closing and latching) of the switchgear.

PS 5.15.8 Earthing

A bare copper earth bus, 50 mm x 6 mm, shall extend along the entire length of the switchgear.

The earth bus shall be firmly mounted on the switchgear frame. A hole and compression lugs shall be provided at each end.

The bonding of the indoor switchgear structure and outdoor housing shall be ensured by proper interconnections of the switchgear earth bus and outdoor housing frame.

PS 5.15.9 Mechanical Construction

Switchboards and switchgear shall consist of individually prefabricated tiers that are aesthetically aligned.

The switchgear assembly shall be modular, completely metal-enclosed sheet steel, dead-front, vertical sections of Manufacturer's standard dimensions, bolted together and mounted on a common channel base to form a free standing and self supporting structure.

Each unit shall include, as required, the following minimum basic elements and features:

- Separate metal-enclosed compartments for each circuit breaker and for relaying, metering and control equipment.
- Main bus, riser and earth bus.
- All busbars and cable connection points readily accessible from the rear.
- Front access to all compartments shall be via hinged doors, strong enough to support metering instruments, relays and other control equipment.

Doors shall be capable of being locked closed.

Space for cable connection shall be adequate for passage and termination of all cables associated with that circuit.

All non-current carrying metallic parts and all instrument transformer circuits shall be bonded to the earth bus.

Lifting eyebolts shall be provided at each corner of each transport unit to facilitate handling and installation.

Compartments shall be fabricated complete with barriers between busses and cable compartments and adjacent cable compartments. Arc barriers shall be installed along the main busbar run at intervals not exceeding three tiers.

Transport units shall be prepared complete and ready for shipment, including all documentation and materials required for assembly. Where internal wiring crosses transport unit boundaries, termination plugs or couplers with full identification tags shall be provided to ensure the minimum disruption of FAT tested wiring and control circuitry.

Removable panels shall be provided at the rear and the sides to allow access to busbars, current transformers and power cable connection points.

Each power cable connection compartment shall be provided with a non-magnetic removable split gland plate (6 mm thick aluminum) sized to accept the planned cable types and number complete with cable glands.

PS 5.15.10 Tests

Switchgears shall be tested in accordance with IEC standards for conformance to the certified performance

during works tests, and any non-compliance with the certified performance shall be rectified.

If Type Test Certificates cannot be supplied by the Vendor with Tender, the Vendor shall undertake validation type testing of the proposed switchgear supply at his cost.

Routine Tests as anticipated in IEC 61439-1 shall be witnessed as part of factory acceptance testing at the option of the Buyer.

PS 5.14.11 Information to Be Supplied

The following information shall be provided:

- Type Test Certificates
- Routine Test protocol
- General brochures and technical data sheets describing the equipment offered
- Drawings showing proposed general arrangement.
- Circuit Diagrams for Approval

PS 5.15 INSTALLATION OF DISTRIBUTION BOARDS

PS 5.15.1 Distribution Boards

Distribution boards shall be installed in the positions as shown on the respective drawings.

The electrical contractor shall ensure that the distribution boards with the necessary conduits, sleeves, and channels as required are placed in position and mounted when required, and he shall ensure that all equipment is installed in the correct positions.

It must be emphasized that no chasing will be allowed in walls built with face-bricks on the side in which distribution boards and ancillary equipment are installed. In any such cases the electrical contractor shall place his equipment in its proper place for the main contractor to build.

The costs of any additional work caused by late, incorrect, or defective positioning of equipment and/or material by the electrical contractor, shall be recovered from him.

The electrical contractor shall, while material and/or equipment forming part of the electrical installation are/is being built in, have a competent representative present to ensure that no unnecessary stress is placed on the material that will influence subsequent installation of equipment.

Care shall be taken that all equipment of the board fit properly in their respective positions without distortion, which can lead to a poor installation and appearance. All bolts, clamps and fasteners shall be examined and properly tightened.

The electrical contractor shall ensure that all circuit breakers and other equipment can be changed and replaced if and when required.

The electrical contractor shall remove all support props, struts, packing pieces and material used by the board manufacturer to prevent damage during transit. The electrical contractor shall examine all boards and ensure that all equipment shown on the appropriate relevant drawings has been supplied and fitted.

Any conspicuous damage like scratches or chafe marks to paint work, shall be touched up to the satisfaction of the Engineer with the same colour paint as supplied by the board supplier.

The mounting height of all distribution boards, measured to the top of the edge of the board shall be 2 000 mm above finished floor level, unless otherwise specified or the position and circumstances dictate differently. The electrical contractor shall ensure that cables sleeves and provision for the entry of cables to distribution boards as shown on drawings are done properly and neatly.

PS 5.15.2 Provision for future equipment

Where space is required for future switchgear and/or equipment, the panel shall be correctly punched for such future switchgear and/or equipment covered by suitable blank covers.

PS 5.15.3 Labels

All distribution boards shall be marked as follows:

- Name of distribution board, ex. "DB-MAIN" as indicated on the drawings
- Origin of supply and size of the main supply and/or all cables, e.g. "Supply from MAIN DB - 16 mm² x 4C PVC SWA PVC and 6 mm² ECC"
- All circuit breakers shall have their current ratings clearly indicated on the handle, or on the panel adjacent to the switchgear
- All circuit breakers shall be properly labelled as to their service, as indicated on the drawings.

PS 5.15.4 Balancing of load and phases

In the three phase distribution boards, all single phase circuits shall be equally distributed over all three phases to balance the electrical load as far as possible.

Where applicable each type of sub-circuit shall separately be balanced over all three phases as far as possible.

PS 5.15.5 CABLE AND WIREWAYS**PS 5.15.5.1 Cable trays and racks**

The electrical contractor shall install supply cables between the distribution section of the MCCs and DBs and the lighting, socket outlets and power points in power skirting and wall mounted equipment as far as possible. Only by exception should conduits be considered to service equipment. Arrangements shall be to the satisfaction of the engineer and prior approval of work methods shall be obtained in writing before any conduit work commences.

PS 5.15.5.2 Cable wireways, channels, trunking and trays

The pattern of cable wireways, channels, trunking and trays is not specifically specified for installation. Where utilized by the Electrical Contractor it shall be of or similar approved by the Engineer.

All cable wireways, trunking, channels, trays, etc. shall be neatly and properly fixed, suspended, clamped or supported with mechanical support accessories specially engineered and manufactured as per detail specifications of.

PS 5.15.5.3 Power skirting

Three Compartment power skirting shall be supplied as detailed on the drawings. Power skirting shall be of or similar, approved make. Colour shall be to the Engineer's approval.

Tenderer's are to indicate separately what premium, if any, is applicable to non-standard colours.

White or grey is the preferred colour. However this must be confirmed with the Engineer prior to ordering.

All corners, bends shall be done and completed in a neat, workmanlike manner. Care shall be taken to not damage any finishes in the building.

PS 5.15.6 SMALL POWER AND LIGHTING DISTRIBUTION

The domestic lighting and socket outlets will be serviced from a distribution section integrated as a separate functional unit in the switchboards and motor control centres and as indicated on the drawings.

PS 5.15.6.1 Wiring

Wiring shall generally be done as described in these documents and shown on the drawings on condition that: Where no mention is made of conduit, the requirements shall also apply to other wireways such as skirting and ducting, where relevant, except that these wireways may contain more than one circuit.

All circuits in these wireways shall, however, be strapped and marked as described. Where "clean lines", i.e. separate circuits from the distribution board, are taken to dedicated socket outlets, more than one circuit may be taken through one conduit.

These cases are not, however, expressly shown on the drawings. All wiring shall be new and neatly installed. Individual circuits especially in trunking and power skirting shall be separated and wired tied together

PS 5.15.6.2 Arrangement of Circuits

The arrangement of the various circuits are indicated on the drawings, together with the required protection (switchgear), control and the type and number of wiring, (conductor or cable) of each circuit.

All protection shall be done with moulded case circuit breakers (MCCB's).

The electrical contractor shall ensure and take care that each circuit breaker is of the correct rating, and in the correct place and position.

No mixing of types, ratings and manufacture of switchgear shall be allowed. The electrical contractor shall check and make sure that the conductors as given for the various circuits, comply with the requirements of the standard specifications of these documents, as well as those of the SABS Code of Practice, SABS 0142 as amended to date.

PS 5.15.6.3 Mounting heights and positions

Mounting heights and positions of all equipment and fittings shall be as given in these documents and/or as given on the drawings.

All cases where doubt may exist shall be referred to the Engineer for a decision. Where standard flush mounted socket outlets are called for, these shall however be mounted 450mm above finished floor level.

PS 5.15.6.4 Isolators, miniature circuit breakers and earth leakage relays

Isolating switches, circuit breakers and earth leakage relays shall comply with the relevant requirements given in the standard specifications of these documents and shall be of CBI or "Merlin Gerin" manufacture, or as may be specified elsewhere in these documents or shown on the drawings.

The let through current of isolating switches and the rupturing capacity of circuit breakers shall be not less than that specified on the respective switchboard diagrams.

PS 5.15.6.5 Switched socket outlets

All flush wall switches shall comply with the latest SABS standard and shall bear the SABS mark.

Equipment shall be of CBI, CLIPSAL, LUMEX or CRABTREE or approved equivalent type, installed in the positions as shown on the drawings and shall comply with the requirements of the specification.

Each socket outlet shall be of the combination type consisting of one 15 A three pin socket and a minimum of 1 off new generation 5A SABS standard three pin socket.

PS 5.15.6.6 Isolators and dedicated outlets (essential circuit or UPS circuit)

A single red socket outlet with a faceted earth pin shall be provided on a separate circuit for the essential (dedicated) supply as indicated on the drawings.

PS 5.15.6.7 Light switches

Switches shall be of or similar approved manufacture, comply with the requirements of this document, have a rating of not less than 16 A and shall be suitable to break the load which is typical of fluorescent tube luminaires.

PS 5.15.6.8 Power points**PS 5.15.6.8.1 Exterior isolators**

Exterior mounted Isolators shall be weatherproof to IP65 standards. The isolators shall be mounted within 1 m of the unit terminals. All final connections shall comply with the requirements of SABS 0142 and 168. Outlets shall be single or three phase IP65 weatherproof surface mounted isolators wall mounted at $\pm 1\,500$ mm above finished floor level in the positions indicated on the drawings.

Final connections to the equipment shall be done via PVC coated flexible steel conduit / or black flexible cable.

PS 5.15.6.8.1 Air conditioning plant and Ventilation

The electrical contractor shall supply and install all required conduit and wiring to connect fans and aircon units as indicated on the drawings.

Other contractors shall do the installation and connection of fans/ventilators.

A suitably rated double pole isolator shall be supplied, installed and connected by the electrical contractor adjacent to each fan or aircon unit.

The final positions shall be determined on site by the AC contractor.

PS 5.15.7 LUMINAIRES**PS 5.15.7.1 General**

Luminaires of the type as indicated on the drawings and indicated in the Bill of Quantities shall be supplied and installed by the electrical contractor.

The electrical contractor shall allow in his tender sum for ordering, receiving, packing out, storing, mounting/fixing and final connections, of all the Luminaires indicated on the drawings.

The electrical contractor shall submit one sample of each luminaire type specified to the Engineer for approval.

No luminaires shall be ordered prior to the Engineer's official written approval of the specific type to be ordered.

Luminaire positions indicated on drawings are diagrammatic, and all positions, spacing, etc., must be

determined in accordance with the Engineer's detail layouts and ceiling plans.

The electrical contractor shall check the engineer's detail ceiling and roof layouts to ensure that all accessories, fixing details, etc. are allowed for.

PS 5.15.7.2 Lamps

All luminaires shall be supplied complete with lamps complying with the requirements of this document and, where applicable, shall bear the SABS mark and be guaranteed for 12 months after the issuing of the completion certificate. All light fittings supplied shall be as specified elsewhere.

PS 5.15.7.3 Electrical Luminaire Connection - Suspended Ceiling Area

In all areas where *suspended type ceilings* are provided, the luminaire outlet point shall consist of a 5 A unswitched socket outlet flush mounted in a round conduit box in the ceiling space.

All luminaires shall be provided complete with a 3m length of 1,5 mm² core white Cabtyre, connected to the luminaire body via a white poly-gland at one end of a moulded 5 A plug top at the other end.

In suspended ceilings the Main Contractor will fix bracker to allow fixing of the surface mounted luminaires and provide holes for the down-lighters.

PS 5.15.7.4 Fixing of luminaires

Luminaires shall be installed in the position(s) indicated on the drawings. The Engineer shall determine final positions.

PS 5.15.7.5 Damage to luminaires

All luminaires damaged by the electrical contractor or his staff before first delivery shall be replaced with new luminaires at his own cost.

PS 5.15.7.5 Height of wall-mounted luminaires

The final height(s) of all wall-mounted luminaires shall be determined on site, and the Electrical Contractor shall request this information timeously from the engineer via the Main Contractor.

PS 5.15.7.6 Photo-electric daylight sensitive switch

Exterior lighting shall be controlled by a photo-electric cell mounted against the exterior of the building with the unit positioned so that the extraneous light shall not affect its operation.

The unit shall comprise a photocell, thermal actuator and changeover switch, rated at not less than 10 amp. The cover of the unit shall be manufactured from a tough, destruction resistant material for protection against tampering. The cover shall have good weatherproofing properties, be ultra violet resistant and shall not deteriorate when exposed to sunlight for prolonged periods. Switch contacts shall be silver-plated and shall be capable of breaking the load associated with fluorescent lamp luminaires. Contact rating shall be not less than 10 A. The operational level shall be factory preset for "ON" at a light level of approximately 54 LUX and "OFF" at approximately 108 LUX. Voltage variations shall not materially affect the operational levels.

A time delay of not less than 15 seconds shall be provided to prevent the unit from functioning due to lightning or other short period changes in illumination.

The unit shall be effectively safeguarded against surges by means of a suitable surge protector which shall preferably form an integral part of the unit.

Bypass switches shall be provided for exterior lights controlled via photo-cells so that testing and maintenance can be done at any time.

PS 5.15.7.7 External lighting

The electrical Contractor shall supply, install and connect the external lighting installation as indicated on the drawings. External luminaires shall have an ingress rating of IP65

PS 9.15.7.8 Telephone Installation

The telephone distribution network, cabling, instruments etc on the site is not part of this contract and is to be arranged directly by the Client.

PS 5.16 TESTING**PS 5.16.1 General**

The contractor shall provide all test equipment and consumables 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 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 and 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, other mechanical plant and pipework or other equipment is tested and commissioned.

PS 5.16.2 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.

PS 5.16.3 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 minimum 500 volts DC or as otherwise stated elsewhere 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.

Site Reticulation :

All tests specified in SANS 10142-1 shall be carried out on all circuits connected to the MCC and distribution and sub distribution board.

PS 5.16.4 Installation Tests

- 1) Tests as stipulated in the "Occupational Health and Safety Act no. 85 of 1993, as amended, and in the "Code of Practice for the Wiring of Premises" SANS 10142 (as amended), must be done. Test report forms must be filled in fully and correctly in ink, signed by the installation electrician and handed to the Engineer or its representative.
- 2) Tests must be conducted on site after the whole installation is complete unless the Engineer grants written permission to the contrary. The tests must include a full-load test for an adequate period to ensure the satisfactory working of the installation. If negative test results are obtained, faults must be rectified, and tests again done.
- 3) The contractor must supply all testing apparatus, correctly calibrated.
- 4) All tests shall be carried out in conjunction with and to the satisfaction of the Supply Authority and in the presence of the Engineer or his representative. The contractor shall make all arrangements for testing and inspection, the costs thereof being included in the Tender Price.
- 5) Each length of cable shall be tested for insulation and polarity by means of a 1000 Volt Megger designed for that purpose. In the case of underground cables this shall be done before back filling. In addition, the earth-loop impedance of each conductor earth electrode shall be measured. The earth resistance shall be tested by means of an approved instrument.
- 6) "Danger" notices shall be displayed at remote ends of cables under test.
- 7) The contractor shall ensure that the installation is completed in every respect and that there are no major defects prior to notifying the Engineer (in writing) for a first delivery inspection. The Engineer will accept zero minor defects during the final inspection. Should the number of defects be exceeded at the final inspection then the Engineer will terminate that inspection and request that the contractor arrange an additional final inspection.

PS 5.16.5 Submittals

Submittals shall include, but not be limited to, the following:

- a) Three (3) copies of certified test results for each test indicated herein, for approval and future references.
- b) Certifications as required herein.
- c) Additional information as required in the specifications.

PS 5.16.6 Conductor Tests (600 Volts or Less)

- a) Prior to energizing of all new feeders, the contractor shall test all conductors for continuity of circuitry and for short circuits. No submittal is required for this test. Each wiring system with devices connected must test free from short circuits and grounds.
- b) Each new feeder conductor shall have its insulation resistance tested after its installation is completed except for connection at its source and point of termination.
- c) Test shall be made using a Megger or equivalent at a voltage of not less than 1000 V-DC, and after one minute of operation at slip speed. Resistance shall be measured by connecting one terminal of the megger to the conductor and other terminal to earth. Reading shall be observed after 15 seconds of operation of the megger.
- d) Conductors which do not meet or exceed the following insulation resistance values shall be removed, replaced, and retested.
- e) Conductor test results shall indicate weather conditions, temperature, relative humidity, date and time, feeder tested, conductor size and type and resistance measurements.

PS 5.16.7 Service Switchboard Earth Resistance Test

- a) Perform a earth resistance test on the switchboard earthing system for comparison of future inspection and testing data by the Owner. Overall system resistance shall not exceed 25 ohms. Eliminate any stray currents, shorts, or non-consistencies in the grounding system.
- b) The test shall be performed using a Megger Earth Tester or equivalent test instrument and shall not be performed immediately following wet weather conditions.
- c) Switchboard earth resistance test results shall indicate weather conditions for test, earthing system tested, earthing configuration and test results.

PS 5.16.8 Earth Fault Protection System Tests**PS 5.16.9 Factory test**

- a) The switchboard ground fault protection system shall be factory tested prior to shipment.
- b) The switchboard manufacturer shall provide factory ground fault interlocking and protection system test for circuit testing, and verification of interlocking and tripping characteristics. The manufacturer shall pass predetermined values of current through the relay sensors, and measure the relay tripping time for each phase, and neutral. The measured time/current relationships shall be compared to the relay trip characteristics curves. If the relay trips outside the range of values indicated on the curve, the relay shall be replaced. This test shall include verification of polarity of the ground sensor circuits' interconnection.
- c) Certified "factory test" results shall indicate relay number, device served, actual characteristic curves, design characteristic curves and overall test results.

PS 5.16.10 Field test

- a) Following completion of the switchgear construction and prior to final acceptance testing, the earth fault protection system shall be field tested and reset to the manufacturer's recommended setting for both time and current, by a representative of the Manufacturer. The field test shall be conducted in a similar manner to the factory test in that a cable from a low voltage, high-current test set shall be passed through each current sensor. This test shall also demonstrate the complete system reliability in that it must operate the associated shunt trips and show that the overcurrent devices which they operate will actually open.
- b) Certified "field test" results shall indicate relay tested, relay settings, and test results.

PS 5.16.11 Special Testing

Certify in writing that the system operation is in accordance with specifications and code requirements.

PS 5.16.12 Balancing of Electrical Circuits

- a) The system of feeder and branch circuits for power and lighting shall be connected to distribution board

busbars in such a manner that loads connected thereto will be balanced on all phases as close as practicable.

- b) Should there be any unfavourable condition of unbalance on any part of the electrical system, the electrical contractor shall make such changes that may be necessary to remedy the unbalanced condition.
- c) Prior to completion of the project, provide a complete list of all panels stating the measured loads on each phase. Test results shall indicate panels tested, amperage per phase, and any remedial action taken.

PS 5.16.13 Operational Testing

- a) Take voltage and currents readings for each feeder and motor circuit under maximum operating conditions. Questionable readings shall be repeated at no cost for confirmation.
- b) Controls for lighting and receptacle circuits shall be demonstrated.
- c) Demonstrate running of motors with controls and interlocks.
- d) Demonstrate operation of electrical equipment appliances.

PS 5.16.14 Cables

- a) Each cable shall be tested after installation in accordance with SANS 1507 (up to 1kV) and SANS 97 (up to 11kV) as well as the requirements of the local and supply authorities.
- b) LV cables shall be tested by means of a suitable megger at 1kV and the insulation resistance shall be tabulated and certified.
- c) MV cables shall be pressure tested in accordance with the manufacturer's recommendations and exact leakage current shall be tabulated and certified.
- d) The contractor shall make all arrangements, pay all fees and provide all equipment for these tests. The cost of testing shall have been included in the tender price.
- e) The contractor shall notify the Engineer and if applicable the Supply Authority timeously so that their representative may witness the tests.
- f) On completion of the tests on any cable, the contractor shall without delay submit three (3) copies of the certified test results to the Engineer.
- g) The contractor shall provide all the testing equipment as required for the respective tests.

PS 5.16.15 Density of Bedding and Back Fill Material

- a) The Engineer may demand a density test to determine the grade of density at the bottom layer of the trench and of the approved back fill material.
- b) If the density is lower than specified the Engineer may demand the removal of the material, replacing of the bottom layer or the back-fill material with the same or other material, and the re-compaction, on the contractor's own expense.

PS 5.16.16 Electrical Tests

Every part of the cable network between CDU's and substations must be tested for electrical continuity and for insulation resistance. Acceptance tests must consist of the following.

- Phase identification test
- A test must be done to determine if the connections between the end points are correct. All cables must be phased out before connected to the switchgear.
- Insulation resistance test (Low voltage cables)

The resistance of the insulation of every core to earth and to every other core must be determined. These tests must be done with a 2 000 V insulation resistance tester on paper and PVC insulated cables.

PS 5.17 TESTING

PS 5.17.1 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.

- c) At manufacturers works before equipment is released to site
- d) During installation where testing is necessary before final connections are made.
- e) 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.

PS 5.17.2 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.

- Insulation resistance of busbars and wiring shall be measured at 500 volts DC using a hand-cranked megger.
- Busbars shall be pressure tested at 2 000 volts AC for 10 minutes.
- Small wiring shall be pressure tested at 2 000 volts AC after disconnection of voltage sensitive devices.
- Functional and simulation tests of control and interlocking circuits shall be carried out.
- Operation of current transformer driven equipment shall be proved by primary current injection. The current transformer ratio and polarity shall be checked.
- 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.
- Test instrumentation used, the calibrating authority and calibration date shall be recorded.
- 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.

PS 5.17.3 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.

PS 5.17.4 PLC Process and Tests

PS 5.17.4.1 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
- f) Program PLC
- g) Create HMI Screens
- h) Send HMI screens for approval
- i) Review and finalise screens with Client and Engineer
- j) Factory acceptance test
- k) Site acceptance test

PS 5.17.4.2 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)
- c) Verify HMI signals correspond to item 1
- d) Verify telemetry signals
- e) Operating and control philosophy
- f) All external signals to be simulated

PS 5.17.4.3 Site Acceptance Test (SAT)

- a) Input & output testing of field wiring and marshalling
- b) Test all signals as per FAT

Full testing and commissioning of the instrumentation shall be undertaken by the contractor in accordance with UGU Standard specification for Instrumentation or the Engineer's specifications. The contractor shall give the Client and Engineer at least two week's notice to carry out the factory acceptance tests (FAT) and site acceptance tests (SAT) especially for the PLC, telemetry and SCADA installations. The above tests shall be carried out in-house and on successful testing before calling the Client Representatives and Engineers to carry out and witness these tests.

All testing and commissioning shall be carried out in a documented format, to be submitted by the contractor for approval.

PS 5.17.4.4 Site Reticulation

All tests specified in SANS 10142-1 shall be carried out on all circuits connected to the MCC and sub distribution board.

PS 5.17.4.5 Certificate of Compliance of Electrical Installation and Motor Control Centres

1. A separate certificate of compliance is required for each complete electrical installation, building or structure in addition to each DB or MCC.
2. A certificate of compliance, type testing and compliance with SANS 1014-2 for each motor control centre is required from the contractor.

PS 5.18 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

PS 5.19 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.

PS 5.20 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.

Earthing of Instruments and surge protection

All instruments shall be connected to a 'clean' earth bar to be provided in the Pump Station Control Room by the electrical contractor. The telemetry cabinet , PLC cabinet, UPS cabinet and all other control panels shall be connected to the earth bar with a minimum of 35mm² PVC insulated earth

conductors.

All instruments such as the level instruments , ultrasonic flow meters etc shall be earthed according with the manufacturer's instructions.

Surge protection devices shall be fitted to all instrument signal cables from field devices.

PS 5.21 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.

PS 5.22 PREFERRED EQUIPMENT

PS 5.22.1 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.

PS 5.23 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.

PS 5.24 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.

The Manufacturer's proposal shall include a complete list of spare parts and the cost for each part. A recommended list of spare parts shall also be provided.

PS 5.25 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.

The final colour shall be approved prior to painting.

All machined and finished surfaces shall be coated with a suitable rust preservative prior to shipping.

Panels fed from stand-by generator shall be painted red to SANS standards.

PS 5.26 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.

PS 5.27 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 5 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 device 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

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- 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
 - Training shall be provided to the Client's operational and maintenance staff

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.

PS 5.28 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.

- a) The project will not be signed off for payment and hand-over before all snags identified in the preliminary inspection are complete and a compliance certificate and test report is issued.

The Client's operational and maintenance staff shall be trained on the operations and maintenance of all mechanical plant, pumps, electrical and instrumentation plant and equipment installed under this contract including the PLC, HMI etc complete.

PS 5.29 SCHEDULE OF PREFERRED AND ACCEPTABLE EQUIPMENT

Note : All equipment is to be as supplied by Schneider . Alternatives will only be accepted where Schneider do not supply those items/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	Schneider or similar approved
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Variable speed drives	Schneider or similar approved
Circuit Breakers, ACB's	Schneider or similar approved
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	O-Line
HRC fuses and holders	G.E.C.
DC Power Supplies	Meanwell Ad-155B
Electrically operated solenoids	Festo, Asco, Burkert
Level Control	Siemens Milltronics Multiranger MR200 DP 6R, Siemens stainless steel echo max transducer brackets FMS310. or IFM as specified (IFM preferred).
Surge Arrestors	Dehnguard 275 and 1 No. DehnGap
Power supplies	Schneider
Relays, timers	Schneider
Terminal relays	Schneider, Weidmuller, Klippon, Phoenix Contact
Electrical motors	WEG
Emergency stop stations, push buttons	Schneider
Circuit breakers	Schneider
Fuse switches	Schneider
Terminals	Schneider, Klippon, Phoenix Contact
Cable glands	CCG Corrogland
Junction boxes	York enclosures, Schneider
Power monitor	Schneider
Open channel measurement flow meter	Siemens Milltronics Multiranger MR-200 DP 6R
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	Efactor (Shorrock Automation)
Solenoid operated valves	Bürkert
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	Schneider
PLC	Schneider
HMI	Schneider
Industrial Ethernet network switch	Unmanaged - Hirschmann Managed - Hirschmann
Pneumatic actuators	Festo, Biman
Electrical Valve actuators	Aumanat
Telemetry Unit	Schneider, Remote Monitoring & Control
Pipework Coating	Plascoat PPA 571 Aqua
Non-Shrink Grout	Pro-Struct 531-MCI

Switches, sockets outlets, isolators etc	Crabtree
Lights	TLF - The Lighting Factor

**PS 5.29 RETURNABLE SCHEDULE FOR MOTOR CONTROL CENTRE (MCC) & DISTRIBUTION BOARD
(Complete one for each MCC and DB)**

Name of MCC or DB :

NO	Requirements	Minimum Requirement	Tenderer of- fer	Tenderer ance	Compli-
1.0	ENCLOSURE				
	MCC / DB Name (specify)				
1.1	Manufacturer				
1.3	Place of Manufacture				
1.4	Type of enclosure	3CR12			
1.5	Type of mounting	Floor or Wall Mount			
1.6	Divider plates				
1.7	Gland plates entry	Top & Bottom			
1.8	IP Rating				
1.9	Degree of protection				
1.10	Physical size				
1.11	Co-ordination type				
1.12	Certified TTA/PTA/STA to SANS1973-1 (specify)				
1.13	Type testing/certification				
1.14	Requirements to SANS 91439				
1.15	Fault level @ 400V				
1.16	Voltage rating				
2.0	EQUIPMENT				
2.1	Circuit Breakers IP65	IP65			
2.2	Contactors				
2.3	Soft Starters				
2.4	VSDs				
2.2	Bus- bars and rating				
2.5					
2.6	Bus bar Clamps				
2.7	VSD's	Password protected. Removable Key Pad			
2.8	Switches IP65				
2.9	Push buttons IP65				
2.10	Indicator lights IP65				
2.11	Fans	Door Mounted			
2.12	Air filters	Door Mounted			
2.13	Amp Meter				
2.14	Voltage Meter				
2.15	Power analyser and power meter	Display Harmonic .IP enabled. Scada Tie in re- quired. Schneider			
2.16	Counters & RHM				
2.17	Surge Arrestors				

2.18 KWH Meter

2.19 Relays

2.20 CTs

2.21 Selector switches

2.22 SPDs

2.23 Other (specify)

PS 9.30 SOLAR POWER INSTALLATION (FOR FUTURE USE)**1. SCOPE OF WORK**

The scope of work will be for the design, manufacture, supply, delivery, installation, testing , commissioning, guarantee and hand over of the complete solar power installation comprising the following :

- Solar power panels
- Racking and mounting components
- Stand-alone structure over the sludge drying beds to support the solar panels
- Charge controller
- Inverter with monitoring facilities
- Lithium batteries
- Solar power distribution board (DB)
- All solar cabling, wiring and wiring accessories
- Power cable from the solar power DB to the aerator MCC
- Lighting protection and earthing for the entire solar power installation and the structure supporting the solar panels
- All other equipment and accessories

The twelve months servicing and maintenance of the installation of the entire solar installation shall be included from the date of the practical completion and taking over of the works.

A site investigation will be required to be conducted by the solar power contractor to determine requirements etc for the solar system design and installation.

STANDARDS AND REGULATIONS

The latest versions of the following standards and regulations shall apply to the solar power and electrical installation :

- 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.
- The Occupational Health and Safety Act (85 of 1993) as amended and contingent regulations.
- Requirements of the Electricity Regulations Act of 2006
- The regulations and standards of the Local Authority or Municipality Electrical Department
- 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

LOAD FOR SOLAR SYSTEM SIZING

The solar power system shall be designed and suitable to supply full power for the following connected loads :

Item	Type of load	No	Total Watts	Total
A. Aerators				
1	Aerator drive motors (VSD powered)	2	30kW	60kW
B. General Lighting				
2	Site LED lighting	1	5kW LED	5W
TOTAL LOAD 65kW				

DRAWINGS

The following electrical drawings are included with this tender for pricing purposes and must be read with this specification at all times.

DRAWING NO. DESCRIPTION

REV

Electrical Drawings :

Drg No Description Rev

N/A N/A

Note : No drawings are included with the tender. The solar power contractor is to produce all drawings of the entire solar power system, this must be included in the pricing.

DESIGN & SPECIFICATIONS

The solar panels are to be installed on the new structure over the sludge drying beds at the WWTW and is to face the sun and be oriented such as to receive sunlight throughout the whole day.

The solar contractor is to check whether the roof of the structure can handle the load of the solar panels on the roof.

The design and installation of the structure to carry the solar panels is to form part of the solar power installation. All the solar panels are to be fixed with anti-theft brackets. The structure or cage is to be manufactured from anti-corrosive materials or be hot dipped galvanised.

A separate elevated ground mounted housing or structure is to be proposed for the solar panels. This shall be included in the pricing for the solar installation.

The solar power design and installation shall be undertaken by a registered electrical contractor under the supervision of a master electrician registered with the Dept of Employment and Labour. The contractor and electrician shall have a minimum 5 years experience in solar power installation. A full CV and experience report must be submitted with the tender for the contractor and electrician.

The necessary licenses and permits shall be obtained and submitted for the solar power installation. These shall be from NERSA and the local municipality where applicable.

DESIGN SPECIFICATIONS :

- - - Standards IEC61215, UL1703, NRS097, SANS10142- 1 & 2
 - 3 Phase PV system rated at 65 kWp 400 Volt. Each panel is to achieve 400 - 500 W (supplier and contractor to verify this)
 - Solar panel module efficiency 16,8% or better
 - Solar panel positions and orientation to be verified on site
 - Type of system - Off grid system (not grid tied)
 - Zero export to incommen or grid
 - Inverter - Pure sine wave DC to AC conversion.
 - Inverter and batteries - Monitoring function on both DC and AC sides including power consumption and amperage readings
 - Solar inverter to have reverse power protection
 - System to have MP2 mains sensing (Note that this is an independent stand-alone system Where Eskom or Municipal power is available)
 - System to have metering function
 - Batteries - Lithium ion 12 or 24 Volt DC (24 Volt preferred) or similar and equal approved.
 - Charge controller and associated equipment
 - Solar panels to be connected in strings of 5 , 10 or 20 (depends on number of panels proposed)
 - Main switch and circuit breakers to have lock-out facilities
 - Suitable earthing shall be provided for the entire installation in terms on SANS10141(details to be provided by the tenderer)
 - Suitable lightning protection and surge protection shall be provided for the entire installation (details to be provided by the tenderer)
 - Suitable racking and mounting structures and facilities to be included
 - All solar power cables and wiring to be fire retardant or fire rated
 - All solar cables shall be installed on suitably sized cable trays, ladders and trunking with appropriate fasteners. All supports, fasteners etc are to be corrosion resistant.

Conduits shall only be used by prior approval of the Engineer.

SOLAR POWER DISTRIBUTION BOARD AND MAINS CABLE

A 230/400Volt 50Hz single or three phase solar power distribution board will be required to receive power from the inverter and solar system. The voltage and phases will depend on the system to be supplied by the contractor.

The DB shall be outdoor surface mounted type with lockable door manufactured from 3CR12 sheetmetal and epoxy powder coated and painted to standard industry colours for solar systems and to current regulations.

The DB shall have a main switch and outgoing breaker/s to supply the normal power DB in the Main Hall.

All equipment in the DBs or other parts of the solar installation shall be as supplied by Circuit Breaker Industries (CBI). Suitably rated surge protection shall be provided in the DBs. A suitable rated single or three phase cable with a 10% safety margin shall be installed between the inverter and the main DB. The cable shall have an earth wire installed with it.

Full technical details and layout of the DB with wiring diagrams is to be supplied for comments and approval prior to manufacture.

DATA AND ITEMS REQUIRED FROM SOLAR POWER SYSTEM CONTRACTOR

The following is required from the solar power tenderer/contractor :

- - - Design details and specifications of the entire solar power installation
 - Full technical details and data, specifications and brochures of the entire solar power installation including all components such as the solar panels, inverters, batteries, charger, charge controller, cables, wiring, racking/mounting details, etc complete
 - Location and positions of the solar panels and all other equipment
 - Design and details for the structure supporting the solar panels
 - Civil and builders work requirements
 - Wind loading calculations and structural requirements
 - Racking and mounting details
 - Fixing details of the solar panels
 - Fixing and mounting details of the batteries and inverters
 - Power requirements
 - Solar panel and system cable specifications and mounting or fixing details
 - Drawings of solar layout and other layouts
 - Layout and diagrams of the solar power installation
 - Wiring diagrams of the entire solar power installation including the solar panels internally and between the panels to the inverters, batteries, charge controller etc
 - As-built drawings and wiring diagrams
 - QCP documentation shall be submitted for all the equipment forming part of the solar installation for comments and approval. No equipment is to be procured without the necessary approvals from the Client or Engineer.

O & M MANUALS AND HAND-OVER DOCUMENTATION

Five copies of the full O & M manuals of the entire solar power installation including the electrical installations is to be submitted. The manual must be in a detailed and comprehensive format and comprise all information and technical data.

TESTING AND COMMISSIONING

Testing and commissioning shall be arranged with the Engineer and at least a weeks notice is required to be given. An accredited COC and compliance certificates shall be submitted for the solar power installation and associated electrical installation in terms of the requirements of the relevant government departments and regulations governing solar power installations.

TECHNICAL RETURNABLE DATA SHEETS – SOLAR POWER INSTALLATION Note : This is compulsory and is to be filled , completed and returned with this tender

Item Description	Data submitted by Tenderer
A. SOLAR DATA	
1 Annual average radiation	
2 Total energy available Wh/day/panel	
3 Solar panel best efficiency angle and which direction	
4 Irradiation performance	
5 Watts/day required	
B. SOLAR PANELS	
Electrical Data :	
1 Manufacturer and supplier of solar panels	
2 Type of solar panels	
3 Country of origin	
4 No of solar panels required	
5 Area of single solar panel	
6 Solar panel efficiency / module efficiency	
7 No of hours of use	

-
- 8 Nominal max power
 - 9 Operating voltage
 - 10 Operating current
 - 11 Open circuit voltage
 - 12 Maximum system voltage
 - 13 Short circuit voltage
 - 14 Module efficiency
 - 15 Operating temp and cell temp
 - 16 Module fire performance
 - 17 Maximum series fuse rating
 - 18 Classification
 - 19 Power tolerance
 - 20 IES/IEC/SANS/UL Standards and Codes system complies to
 - 21 Mounting and racking details
 - Mechanical Data :
 - 22 Area of single solar panel
 - 23 Cell type
 - 24 Dimensions per panel and total dimensions
 - 25 Weight per panel and total weight
 - 26 Front cover
 - 27 Frame material
 - 28 Components for racking and mounting and type/sizes
 - 29 J-Box (IP67) and sizes
 - 30 Cable type and fire rating
 - 31 Cable sizes
 - 32 Wiring sizes and type
 - 33 Connection type
 - 34 Size and details of structure to accommodate the solar panels

C. BATTERY & CHARGER

- 1 Make and manufacturer of batteries
- 2 Type of batteries
- 3 Country of origin
- 4 No of batteries required
- 5 Capacity of single battery
- 6 Capacity of all batteries combined
- 7 Voltage
- 8 Watts/day required
- 9 Allowed DOD
- 10 Irradiation performance
- 11 No of autonomous days
- 12 Mounting details of batteries
- 13 Anti theft and vandalism measures
- 14 Other details on batteries provided
- 15 Is a battery charger provided (no Eskom or Municipality power is available)
- 16 If yes , manufacturer of charger
- 17 Type of charger
- 18 Charging rate
- 19 Time to charge batteries from low to full charge
- 20 IES/IEC/SANS/UL Standards and Codes system complies to

21 Other details provided

D. INVERTERS

- 1 Make and manufacturer of inverters
- 2 Type of inverters
- 3 Type of technology
- 4 Country of origin
- 5 Voltage , wattage and amperes
- 6 Type of monitoring provided
- 7 Dimensions of inverters
- 8 Physical sizes of inverter
- 9 Weight of single inverter or multiples of inverters
- 10 Other details and specifications provided

E. CHARGE CONTROLLER

- 1 Make and manufacturer of controller
- 2 Type of controller
- 3 Country origin of controller
- 4 Type of technology
- 5 Voltage, wattage and amperes
- 6 Dimensions of controller
- 7 Physical sizes of controller
- 8 Weight of controller
- 9 Other details and specifications provided

F. OTHER DATA

- 1 Total area of roof space required for solar panels
- 2 Total area of plant room required for batteries , inverters etc
- 3 Ventilation provided and type of ventilation required
- 4 Type of mains power cables and sizes
- 5 Fire rating of solar cables
- 6 Type of lightning protection provided
- 7 Type of earthing systems provided
- 8 Other details/info provided

**PART B: AMENDMENTS TO THE STANDARD SPECIFICATIONS AND OTHER ADDITIONAL
SPECIFICATIONS****INTRODUCTION**

In certain clauses in the Standard Specifications, allowance is made for 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 Part B1 of the project specifications.

The number of each clause and each payment item in this part of the project specifications is prefixed "PS" and numbered sequentially followed by a number corresponding to the relevant clause or payment item in the standard specification in parentheses.

New clauses and payment items not covered by clauses or items in the Standard Specifications have also been included.

Additional particular specifications are also included in Part B2 and are prefixed "P" and numbered alphabetically.

PART B1: AMENDMENTS TO THE STANDARD SPECIFICATIONS**PSA GENERAL****PSA.1 MATERIALS (3)****PSA 1.1 QUALITY (3.1)**

All materials used in this contract shall comply with the relevant SABS Specification (as amended) or particular specification as noted.

The following materials are to bear the SANS/ANSI/ standardisation mark:

- (a) Valves
- (b) uPVC, oPVC and steel pipes
- (c) Cement in bags
- (d) All precast concrete products

PSA.2 PLANT (4)**PSA.2.1 PLANT FOR CONSTRUCTION PURPOSES (No reference)**

The Contractor's plant for construction purposes shall be of modern design, adaptable for the purpose for which it is required, in sound condition, and ample in capacity for carrying out the Works expeditiously.

Should the Engineer be of the opinion that the plant in use is in any way unsuitable for carrying out the Works in a manner or at a rate commensurate with the requirements of the Contract, they shall have the right to call on the Contractor at any time during the progress of the works to provide additional or improved plant and tools as may be necessary to meet these requirements.

PSA.2.2 CONTRACTOR'S CAMP (4.2)

No housing is available for the Contractor's employees, and the Contractor shall make his own arrangements with the Local Authority regarding the housing of his employees and transporting them to site.

The Contractor shall provide in locations approved by the Engineer, adequate sanitary facilities for the use of all persons engaged on the Works. Such conveniences, which shall comply with Local Authority regulations, shall be maintained in a clean and hygienic condition and shall be properly secluded from public view and their use shall be strictly enforced.

The Contractor shall make his own arrangements with the municipal authorities for any bucket removals and shall bear all the costs in connection with such service. On removal of such conveniences the sites thereof shall be left in a clean, sanitary and tidy condition.

**PSA.3 PERSONAL & OTHER PROTECTIVE EQUIPMENT
(SECTIONS 8/15/23 OR THE OHS ACT)**

The Contractor is required to identify the hazards in the workplace and deal with them. He must either remove them or, where impracticable take steps to protect workers and make it possible for them to work safely and without risk to health under the hazardous conditions.

Personal Protective equipment (PPE) should, however, be the last resort and there should always first be an attempt to apply engineering and other solutions to mitigating hazardous situations before the issuing of PPE is considered.

Where it is not possible to create an absolutely safe and healthy workplace the Contractor is

required to inform employees regarding this and issue, free of charge, suitable equipment to protect them from any hazards being present and that allows them to work safely and without risk to health in the hazardous environment.

It is a further requirement that the said equipment be maintained by the Contractor, that he instructs and trains the employees in the use of the equipment and ensures that the prescribed equipment is used by the employee/s.

Employees do not have the right to refuse to use/wear the equipment prescribed by the employer and, if it is impossible for an employee to use or wear prescribed protective equipment through health or any other reason, the employee cannot be allowed to continue working under the hazardous condition/s for which the equipment was prescribed but an alternative solution has to be found that may include relocating or discharging the employee.

The Contractor may not charge any fee for protective equipment prescribed by him/her but may charge for equipment under the following conditions:

- Where the employee requests additional issue in excess of what is prescribed
- Where the employee has patently abused or neglected the equipment leading to early failure
- Where the employee has lost the equipment

All employees shall, as a minimum, be required to wear the following PPE on any projects:

- Protective overalls
- Protective footwear
- Protective headwear
- Eye/face protection

All PPE provided to local labour working on the Expanded Public Works Programme shall be branded in accordance with the EPWP CI Manual. Typical elements which shall be branded include:

- Protective overalls
- Reflective vests
- Protective headwear

The rate for local labour shall include for the supply of 2sets of EPWP branded PPE in accordance with the Provincial EPWP specifications. The rate shall include the additional cost of the specified colours for the PPE and branding in accordance with CI manual.

THE TENDERED RATE SHALL INCLUDE FULL COMPENSATION FOR BRANDING THE PPE AS DETERMINED IN THE RISK ASSESSMENTS AND AS REQUIRED FOR FULL DURATION OF THE CONTRACT.

PSA.4

EPWP SIGNBOARD

The Contractor will be required to erect a signboard displaying the EPWP logo, indicating that this project is part of the EPWP. All costs related to the provision, erection and subsequent removal of the signboard shall be refunded to the Contractor through the provisional sum included in the Schedule of Quantities for this purpose.

PSA.5

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.

(a) Duties of the Community Liaison Officer

The Community Liaison Officer's duties will be:

- (i) To be available on site daily between the hours of 07h30 and 16h30 and at other time as the need arises. His normal working day will extend from morning until 17h30 in the afternoon.
 - (ii) 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.
 - (iii) 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.
 - (iv) To assist in and facilitate in the recruitment of suitable temporary labour and the establishment of a "labour desk".
 - (v) To attend all meetings in which the community and/or labour are present or are required to be represented.
 - (vi) To assist in the identification, and screening of labourers from the community in accordance with the contractor's requirements.
 - (vii) 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.
 - (viii) To attend disciplinary proceedings to ensure that hearings are fair and reasonable.
 - (ix) To keep a daily written record of his interviews and community liaison.
 - (x) To attend monthly site meetings to report on labour and RDP matters.
 - (xi) All such other duties as agreed upon between all parties concerned.
 - (xii) To submit monthly returns regarding community liaison as illustrated in Part C5.1 of this document (form RDP 12(E)).
- (b) 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.
- (c) 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.

PSA.6 COMMUNITY PARTICIPATION.

PSA.6.1 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.

PSA.6.2 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.

PSA.6.3 PROCEDURES

PSA.6.3.1 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.

PSA.6.3.2 The PLC shall make recommendations by consensus. If consensus cannot 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.

PSA.6.4 **TASKS OF THE PLC**

- 2.4.1 To assist with community liaison and resolution of disputes.
- 2.4.2 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.
- 2.4.3 To advise on and monitor labour issues.
- 2.4.4 To assist in resolving labour disputes.

PSA.6.5 **ASSISTANCE TO THE PLC**

- PSA.6.5.1** 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.

PSA.7 **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.

PSA.8 **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.

PSA.9 **LABOUR-INTENSIVE CONSTRUCTION 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.

PSA9.1 MATERIAL

Where possible, the contractor shall source material from within 0.5 km of the site utilizing local labour. The material which may be sourced from site includes:
Rock for gabions and stone pitching

PSA9.2 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.

PSA.10 REQUIREMENTS OF EXPANDED PUBLIC WORKS PROGRAMME**PSA10.1 EPWP PROJECT SPECIFICATION**

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.

PSA.11 EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR INTENSIVE WORKS

Requirements for the sourcing and engagement of labour.

PSA.11.1 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.

PSA.11.2 The rate of pay for the EPWP is set by the UDM in consultation with the community leaders.

PSA.11.3 Tasks established by the contractor must be such that:
a) the average worker completes 5 tasks per week in 40 hours or less; and b) the weakest worker completes 5 tasks per week in 55 hours or less.

PSA.11.4 The contractor must revise the time taken to complete a task whenever it is established that the time taken to complete a weekly task is not within the requirements of 11.3.

PSA.11.5 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:

- a) where the head of the household has less than a primary school education;
- b) that have less than one full time person earning an income;
- c) where subsistence agriculture is the source of income.
- d) those who are not in receipt of any social security pension income

PSA.11.6 The Contractor shall endeavor to ensure that the expenditure on the employment of temporary workers is in the following proportions:

- a) 55 % women;
- b) 55% youth who are between the ages of 18 and 35; and
- c) 2% on persons with disabilities.

PSA.12 CONSTRUCTION**PSA.12.1 Setting out of the works**

It is the contractor's responsibility to set out the works. The contractor shall employ a competent surveyor to set the works out accurately.

The tenderer's attention is drawn to the fact that minor changes to the setting out of the works may be necessary. The setting out of the works shall therefore be done in close co-operation with the representative of the client to ensure minimal disruption, should adjustments be required.

Co-ordinated benchmarks will be provided and the works shall be set out from these benchmarks.

The contractor shall be responsible for the safe guarding of all benchmarks and other survey pegs. In the event of any of these pegs being displaced, removed or otherwise interfered with, the contractor is responsible, at his own expense, for having these benchmarks re-established by a registered land surveyor.

PSA.12.2 Protection of services

Where, in the course of excavation, the contractor shall lay bare any water mains, pipes, cables, telegraph or telephone poles, or any existing structures, these shall be securely shored, strutted or slung and sufficiently protected to ensure that no damage shall be done to them until filling has been placed around them. All work in this regard shall be done with notice to and in close co-operation with the respective owners. The contractor shall not refill the excavation around any services, until the services have been inspected and passed as intact by their respective owners.

PSAB ENGINEER'S OFFICE**PSAB.1 NORMAL PROJECTS (3)****PSAB.1.1 NAMEBOARDS (3.1)**

In the third line of Subclause 3.1 delete "South African Institution of Civil Engineers" and replace with "Consulting Engineers South Africa"

The Contractor shall supply two nameboard in accordance with the details indicated in this document.

The board shall be placed in a position designated by the Engineer.

This board shall remain the property of the Contractor who shall dismantle and remove the said board on completion of the contract.

PSAB.1.2 OFFICE BUILDINGS (3.2)

One site office shall be provided of at least 20m² area, complete with a level, 85mm concrete floor over 250micron USB green water proofing , insulated roof / ceiling, lockable door and be supplied with a table of at least 3.0m x 1.8m and 12 chairs. Allowance shall be made for the proper display and storage of plans.

In addition this office shall be fitted with an air conditioning unit of at least 12000 BTU capacity and powered by the contractor's electrical provision / arrangement during meetings at least twice monthly. This office shall not be used for the contractor's storeroom.

This office will be paid for per week and only once it is erected and approved.

At least one pit latrine or chemical toilets, suitably enclosed, shall be maintained close to all the engineers office at all times. All possible measures shall be taken to control odors.

One office with a lean to carport is required.

A cell phone must be provided for the exclusive use of the Employers Agent or Agent's Representative and a maximum of R3000/month must be allowed for call charges.

PSAB.1.3 LABORATORY (3.2.3)

Provide a suitably sized concrete curing pit / bath, filled with water and maintained, to keep all concrete test cubes submerged prior to delivery to an independent test laboratory.

PSAB.1.4 SURVEY FACILITIES (3.2.4)

The Contractor shall make available on site and maintain for use by the Engineer and / or his representative the following:-

- a) Two survey assistants as and when required.
- b) Two automatic levels (new, with calibration certificates) each with tripod;
- c) Two level staffs, all graduated metrically;
- d) Two 5m and one 30m tape measure;
- e) four ranging rods;
- f) steel pegs – No: 50, 12 mm dia. x 400 mm long; and
- g) Two x 1.8kg hammer.

PSC

SITE CLEARANCE

PSC.1

MATERIALS (3)

PSC .1.1

DISPOSAL OF MATERIAL (3.1)

Suitable spoil sites will be located on site by the Engineer and confirmed by the issue of a site instruction. The Contractor may not make his own arrangements in this regard without the written approval of the Engineer. The tenderer shall allow for free-haul of 2 km in the rates.

PSC.2

CONSTRUCTION (5)

PSC.2.1

AREAS TO BE CLEARED AND GRUBBED (5.1)

Areas to be cleared and grubbed shall be classified as follows:

- a) General Clearing and Grubbing

Any areas requiring particular clearing and grubbing must be agreed with the Engineer prior to any such clearing taking place. Any area cleared without the consent of the Engineer will not be measured in terms of this Clause and may result in further action being taken against the Contractor in terms of any contravention with the environmental management plan. Where the Engineer has instructed that clearing must take place or is required, it shall be measured as a strip 3m wide, and topsoil shall be removed to a depth of 150mm.

Trees will not be measured individually but the approximate area will be given as an indication of the effort require to remove the trees.

PSD EARTHWORKS**PSD.1 MATERIALS (3)****PSD .1.1 CLASSIFICATION FOR EXCAVATION PURPOSES (3.1)**

Classification of material other than "soft excavation" shall be agreed with the Engineer before excavation may be commenced.

The Contractor shall immediately inform the Engineer if and when the nature of the material being excavated changes to such an extent that a new classification for further excavation is warranted. Failure on the part of the Contractor to advise the Engineer thereof in good time shall entitle the Engineer to classify, at his discretion, such excavation as may have been executed in material of a different nature.

For the purpose of this contract all material will either be classed as, intermediate, hard rock or Boulder Class A.

No differentiation shall be made between "intermediate" and "Boulder Class B" excavation.

PSD.1.2 Classes of excavation (3.1.2)

a) 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"

e) Boulder excavation Class B - Shall be classified as intermediate excavation

PSD.2 CONSTRUCTION (5)**PSD.2.1 Conservation of Topsoil (5.2.1.2)**

Topsoil stripping shall be 150mm and the material shall be conserved separately for re-use as specified in the environmental management plan.

PSD.2.2 Disposal (5.2.2.3)

All excess material shall be disposed of at the designated spoil sites leveled in layers not exceeding 300 mm and compacted to 90% MOD AASHTO density.

PSD.2.3 Erosion Control Berms (Add new Clause 5.2.3.3)

Where instructed by the Engineer, earth berms shall be constructed to the dimensions shown on the drawings or to the detail instructed by the Engineer. The berms shall comprise excess fill material from the trench, shall be hauled by wheelbarrow, placed and shall be hand stamped in layers not exceeding 150mm. The berms shall be slightly overfilled before being shaped to the detail shown on the drawings. The material shall wherever possible be sourced within the free haul distance of 500m. After completion, the Engineer may instruct the Contractor to construct un-grouted, handpicked and packed stone pitching along the upstream edge of the berm.

PSD.2.4 Sandbag Protection to Pipe Trench (Add new Clause 5.2.3.4)

Where instructed by the Engineer, 25kg sandbags made from woven polypropylene shall be filled with selected fill material as specified in SABS 1200 LB and placed in a stretcher bond pattern around the pipe. The bags shall be firmly packed, and hand stamped into place and

shall be keyed a minimum of 500mm into the side wall of the trench. Where specified, the selected fill material shall first be brought to optimum moisture and then stabilized by the addition of 1% cement.

PSD.2.5 EPWP Construction Methods

The generic labour-intensive specification below is the same as sans 1921-5, construction and management requirement for works 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.

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 1.5metres
- b. Stormwater drainage
- c. Low-volume roads & sidewalks

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.

HAND EXCAVATEABLE 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:
 - (iii.) 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 are material with a particle size greater than 200mm, between 60 and 200mm.
- 2) A dynamic cone penetrometer is an instrument used to measure the in-situ shear resistance of 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 respect 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 the shaft of the handle.
loose	Small resistance to penetration by sharp end 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 a geological pick.	Firm	Indented by thumb with effort; sharp end of a geological pick can be pushed in up to 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 thumbnail; 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 thumbnail with difficulty: slight indentation produced but blow of a geological pick point.

Trench Excavation

All hand excavatable 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

- to 90% Proctor density;
- Such that in excess of 5 blows of a dynamic cone 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
- 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 excavatable material including topsoil classified as hand excavatable 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

PSD.3 MEASUREMENT AND PAYMENT

PSD.3.1 Erosion Control Berms Unit (m³)

The rate shall include for all costs to source the material, remove any oversized material, load, haul within the free haul, offload, spread, overfill, compact and trim to the finished dimensions shown on the drawings.

PSD.3.2 Sandbag Protection to Pipe Trench..... Unit (No)

The rate shall include for all costs to supply the 25kg bags, select material, fill bags, place in restricted areas and hand stamp.

PSD.3.3 Extra-Over Sandbag Protection for Stabilisation.....Unit (No)

The rates shall include all extra costs to ensure that the material is at optimum and to supply and mix cement at 1%.

PSD.3.4 Extra over sub-item for excavation by hand using hand toolcubic metre (m³)

Measurement shall be as specified for pay item 22.01 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.

PSDB EARTHWORKS (PIPE TRENCHES)

PSDB.1 MATERIALS (3)

PSDB.1.1 CLASSES OF EXCAVATION (3.1)

The classification of excavated materials shall be as specified in Subclause 3.1 of SABS 1200 D and PSD.1.2.

PSDB.1.2 SELECTION (3.3)

The Contractor shall select suitable material for stock piling and re-use from the excavated material. The rock excavation will either be spoiled or crushed and graded for re-use.

PSD.1.3 SELECTION (3.7)

The Contractor shall excavate an additional 350 mm for all pipelines and import material to form a 200 mm layer for support of the bedding material. The bedding layer and fill blanket shall be imported material. The remainder of sub-clause 3.7 still pertains to this Contract. No additional payment item will be scheduled for the selective method of excavating and the Contractor must allow in his excavation rates for this work. The method of excavation and placing of the excavated material must be done to ensure compliance with the condition of dealing with stormwater and the HSP.

PSDB.1.3 CONTROL OF WATER (4.2)

The Contractor may encounter some seepage water in some of the trench excavation. No separate payment will be made for measures required to deal with this water.

PSDB.2 CONSTRUCTION (5)

PSD.2.1 **Trench Widths (Subclause 4.1 and 5.2)**

The minimum base widths of the trenches for the pipes laid will basically be as indicated in sub-clause 8.2.3. The trench width for pipe diameters of 300 mm and less shall be minimum pipe diameter plus 500mm (250 mm side allowance) to allow adequate working space for proper jointing and laying of pipe, but shall not be wider than pipe diameter plus 600 mm

Trench sides should be as near vertical as possible in order to minimize the quantity of selected fill material to be provided and also to avoid possible difficulties where the pipeline routes run parallel to existing services, fences, rows of trees, etc.

PSD.2.2 **Trench Bottom (Subclause 5.5)**

Add the following to subclause 5.5

The representative of the client must be notified when a trench bottom is fully prepared to receive pipes and ready for inspection. No trench will be taken to be completely excavated and ready to receive pipes, until the representative of the client has approved that the contractor may proceed with the laying of pipe on the specific section of trench. A detailed "Procedure Schedule" will be kept where the date that the bedding was inspected will be written in as well as test results (if any) that were done to control the bedding density. On the same schedule the checking of pipe levels will be written in when controlled and approved.

Add "When the trench bottom is unsuitable due to waterlogged conditions, at the direction of the Engineer the Contractor shall excavate for and lay a crushed stone mat of minimum thickness 100mm, the stone having a maximum particle size of 13 mm."

Add "The bottom of excavation for manholes and headwalls in soft ground shall be thoroughly rammed and consolidated at the Contractor's expense, before any concrete is placed."

PSDB.2.3 **BACKFILLING** (5.6)

PSDB.2.3.1 **General** (5.6.1)

ADD the following to the clause:

No thrust block or pipe requiring special wrapping may be covered by either the fill blanket or the main backfill until inspected and passed by the Engineer.

PSDB.2.3.2 **Disposal of unsuitable and make up of deficiency of backfill material** (5.6.3 and 5.6.5)

The free-haul distance shall be the entire site of works, for each project.

PSDB.2.3.3 **Completion of backfilling** (Clause 5.6.6)

Backfilling around the pipe shall not be allowed to fall more than 0.1km behind the laying of the pipe.

After the pipes have been laid, no backfilling shall be undertaken until the pipes have been inspected and approved by the Engineer.

The Contractor may use his discretion as to whether to backfill around joints before the pipeline is tested and should he decide to backfill the joints he shall be responsible for the locating of any leaks and no extra payment shall be made for any re-excavation and subsequent reinstatement.

Density tests will be required where the trench bottom layer consists of two (2) or more 200 mm thick layers for quality control purposes. The minimum density required for soil backfilled material is 93% MOD AASHTO. At road crossings the backfill must be compacted to 95% of MOD AASHTO density. DCP tests may be used to establish the achieved compaction density.

PSDB.2.4 **COMPACTION** (5.7)

PSDB.2.4.1 **Areas subject to traffic loads** (5.7.2)

Areas subject to traffic loads will be instructed by the Engineer in writing. No other areas will be considered for payment. The contractor will be expected to provide test results from an approved laboratory demonstrating that the additional compactive effort has been achieved. No additional payment will be made for these tests.

PSDB.2.5 **SHORING** (5.11)

In view of the fact that the excavation will take place in open areas, no additional payment will be made for shoring. The measurement width will also remain as specified herein although the Contractor may wish to batter the sides to avoid the need for shoring.

The provision for shoring shall be deemed to be included in the relevant rates for excavation. The Contractor's attention is drawn to the need to operate safely and to ensure that trenches are either shored or battered to a safe slope.

PSDB.3

MEASUREMENT AND PAYMENT (8)

PSDB.3.1

BASIC PRINCIPLES (8.1)

In addition to the activities listed in 8.1.1, excavation shall also include for the cost of piping and compacting the trench bottom to a minimum of 90% MOD AASHTO density in all materials irrespective of whether the base has been loosened or not during excavation. The tendered rate shall also include for all temporary timbering, shoring and strutting for keeping excavations safe, (sub-clause 8.2.4) for dealing with any surface or sub-surface water and for any other operations necessary to complete the work as specified.

PSDB.3.2

Excavation ancillaries (8.3.3)

PSDB.3.2.1

Overhaul (8.3.3.4)

Overhaul distance shall be calculated from the point of loading to the point of placing less the 0,1km free haul, in one direction only, by the shortest practicable route. Only one type of overhaul will be measured. All haul within the boundaries of the Site/Water works will be regarded as freehaul.

PSDK GABIONS AND PITCHING**PSDK.1 MATERIALS (3)****PSDK .1.1 Gabion Cages (3.1.2)**

The cages for gabion baskets shall comprise mesh type 80 and 2.7mm Class A galvanized wire. The cages for reno mattresses shall comprise mesh type 60 with 2.2mm Class A galvanized wire.

PSDK .1.2 Geotextile (3.1.3)

The geotextile shall comprise grade A2 as indicated in the tables below.

Properties		Units	Standard Grades							Test Methods
			A1	A2	A3	A4	A5	A6	A7	
Thickness	Thickness under 2 kPa	mm	1.3	1.6	1.8	2.1	2.7	3.4	4.4	SABS 0221-88
Permittivity	@ 100mm head	S ⁻¹	3	2.9	2.5	2.3	2	1.7	1.1	Cal
Porosity	Under 2 kPa	%	93	93	93	93	93	92	90	GTS
Throughflow	@ 100mm head	l/s/m ²	300	285	250	235	200	180	110	SABS 0221-88
Permeability	1.0 x 10 ⁻³	m/s	3.9	4.3	4.5	4.9	5.4	5.9	4.8	
Pore Size	O _{95W}	µm	240	225	205	190	165	145	100	Franzius Institute
	O _{95H}	µm	195	185	170	155	125	100	70	NF, G 38017
Penetration Load	CBR	kN	1.5	1.7	2.1	2.5	3.6	4.5	6.5	SABS 0221-88
	Elongation	%	30-50							

Installation Conditions	Grade of Geotextile				
	A1	A2	A3	A4	A5
Trench < 2.0m dep with smooth sides and rounded drainage stone with moderate compaction	•				
Trench < 2.0m deep with rough sides or sharp drainage stone with moderate compaction		•			
Trench < 2.0m deep with rough sides or sharp drainage stone with high compaction			•		
Trench > 2.0m deep with smooth sides and rounded drainage stone with moderate compaction				•	
Trench > 2.0m deep with rough sides or sharp drainage stone with high compaction					•

PSDK.1.3 Stone (3.2.1)

The stone to be used on this contract shall be as classified as medium in terms of Table 2.

PSDK.2 CONSTRUCTION (5)**PSDK.2.1 Stone Catchwater Berms (New clause 5.3.6)**

Where instructed by the Engineer, stone catchwater berms shall be constructed to the dimensions shown on the drawings. The stone shall be classified as medium in terms of Clause 3.2.1 Table 2. The placing of the stones shall be as specified in Clause 5.3.2 with the exception that the last paragraph of Clause 5.3.2 is to be deleted.

PSG STRUCTURAL CONCRETE**PSG 1 FORM WORK (5.2)****PSG 1.1 Formed Finishes**

Are those concrete surface finishes developed using formwork and whose standard of finish in each class shall be as described.

The Contractor shall inform the Engineer of any defect in terms of this Specification and the Contractor without the prior approval of the Engineer shall carry out no remedial work. Any defect shall be made good at the Contractor's expense by either removing and replacing the defective concrete, or, in certain instances only, by patching, all as approved by the Engineer and to the standard of finish required.

All exposed concrete surfaces shall be finished to **degree II** of accuracy unless otherwise stated on the drawings.

PSG 1.2 Class F1 Ordinary Finish

Formwork panels shall be of such quality that upon removal, the concrete is true and even, free from fins and recesses greater than 5mm size, honeycombing, large air holes and the like. Blowholes shall be filled if so required by the Engineer.

PSG 1.3 Class F2 Smooth Finish

This class of finish requires a high standard concrete work, formwork and technique.

Concrete placed in any one structure to give this finish shall be made from cement and aggregates from the same source, and similarly, the grading of the aggregate shall be kept constant.

Formwork shall be metal or wrot timber in a new condition designed and constructed to suit the particular job in hand and with shutter bolts and joints between panels in a regular pattern approved by the Engineer. Joints between panels shall be watertight.

Construction joints shall be in the position and of the detail shown upon the working drawings. Should the Contractor wish to incorporate further construction joints or amend the position of those shown to suit his own requirements or technique, this may be allowed provided that all design considerations are met, that the prior approval of the Engineer is obtained and that any extra costs are borne by the Contractor. In the case of horizontal construction joints, the top edge of the concrete on the Class F2 smooth finish is to be struck true and level with a trowel. Special care shall be taken to ensure that forms are clean of all pieces of tying wire, nails and other debris at the time of concreting.

The standard of finish shall be such that, upon removal of the formwork, no further treatment, other than treatment of bolt holes if required, shall be found necessary to provide a straight, smooth and uniform finish of good quality and consistent colour and texture, free of all honeycombing and large air holes.

PSG 2 **WATER RETAINING STRUCTURES** (5.5.11)**PSG.2.1** **DESIGN OF CONCRETE MIX**

The design of the concrete mix should be based on the following: the minimum cement content should be 360kg/m³ concrete and for reinforced concrete the cement content should not exceed 400kg/m³ or 450kg/m³ where cement containing p.f.a. are used. A maximum water / cement ratio of 0.5 should be used and the 28 day characteristic cube strength should not be less than 35 N/mm². 600g/m³ Polypropylene Microfibers should be added to the concrete mix.

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.

PSG.2.2 **WATERTIGHT CONCRETE**

Completed concrete structures shall be watertight. The quality and finish of the concrete surface shall be such that no further treatment such as plastering or cement wash is necessary to ensure compliance with the specification.

The works will not be certified complete until the water retaining structures have been proved to be watertight by testing.

Upon completion of construction and when so agreed by the Representative of the client, structures shall be filled by the gradual admission of water until the water (48 hours period) level reaches the designed maximum level. The water level shall then be carefully noted and recorded by the Representative of the client in relation to a fixed bench mark, and the structure shall be allowed to remain filled for a period of 2 weeks or such longer time as may be required to permit complete saturation of the concrete. During this period, readings will be taken by the Representative of the client and the results so obtained will be available for the information of the Contractor.

At the end of this period more water shall be added, if necessary, to bring the water level back to the designated maximum level and the water shall be left undisturbed for a period of at least 4 days during which time the level shall again be recorded by the Representative of the client at regular intervals. The structure shall be considered to be watertight if the drop in water level does not exceed 6mm in 96 hours and if no leakage is apparent.

If appreciable leakage is evident at any stage during filling or testing or if, in the opinion of the Representative of the client, the degree of water tightness is unsatisfactory, the Contractor shall, when so ordered by the Representative of the client, discontinue the test immediately and, at his own expense, take approved steps to rectify the work. The work of rectification shall be continued assiduously until, on repetition of the test procedure, a satisfactory test results is obtained and the degree of water tightness is acceptable.

Water for the first filling and testing of the structure will be made available to the Contractor free of charge.

Water tightness of the structure roof shall be tested by the continuous sprinkling of water over the roof with approved sprinklers so that a film of water is maintained on the surface of the slab. The roof shall be considered watertight if no damp patches are visible on the underside after 48 hours of sprinkling.

The Representative of the client reserves the right to have the structure re-tested before the available to the Contractor. If these test indicate to the Representative of the client that the level of water tightness is unsatisfactory, the Representative of the client will, (before issuing the completion certificate) be entitled to order the Contractor to rectify the works on his own costs, to such extend that the disturbance in water supply to users will be minimized and to ensure that the level of water tightness will be satisfactory.

PSG.2.2.1 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".

PSG.2.2.2 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.

PSG.2.2.3 CONCRETE FINISHES

All exposed concrete surfaces shall be finished to degree II of accuracy unless otherwise stated on the drawings.

PSG.2.2.4 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.

PSG.2.2.5 PERMANENT JOINTS IN CONCRETE STRUCTURES

PSG.2.2.5.1 GENERAL

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.

PSG.2.2.5.2 MATERIAL

a) 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).

b) 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.

c) WATERSTOPS

1) GENERAL

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.

2) RUBBER WATERSTOPS

Natural rubber waterstops must contain at least 70% natural rubber, and must have the following characteristics:

Hardness	:	(B.S.S 903 / Part A7 1957): 60-65 IRH grade
Tensile strength	:	21 MPa at 25°C
Lengthening at break point	:	500% at 25°C

Density : 1100 kg/m³

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.

3) PVC WATERSTOPS

PVC waterstops must have the following characteristics:

Density : 1300 kg/m³ (min)

Tensile strength : 14 MPa at 25°C

Lengthening at break point : 300% (min) at 25°C

BS Hardness grade : 42 - 52 at 25°C

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.

4) 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.

PSG.2.5.3 JOINTS

a) 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.

b) 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.

PSG.2.5.4 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 waterstop 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.

PSG.2.5.5 MEASUREMENT AND PAYMENT

Measurement and payment for the expansion joints and open joints will be done per linear meter for the complete joint according to size and type as specified on drawings.

The tendered rate must allow for the delivery of all materials, inclusive of shuttering, primers, fillers, galvanized metal cover strips, nails, bitumen emulsion epoxy, roof felt, bitumen mastic,

sealer, waterstops etc. the manufacturing and jointing of waterstops, all preparations, forming and installation of joints as shown on the drawings, as well as testing of the joints.

PSG.3 REINFORCEMENT (Sub-clause 6.2)

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.

PSG.4 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.

PSG.5 NO-FINES CONCRETE**PSG.5.1 MATERIALS**

Cement, aggregates and water must comply with the requirements of the relevant SABS specifications. Each size of aggregate must be a single size, graded to SABS 1083.

PSG.5.2 NO-FINES CONCRETE CLASSES

No-fines concrete is classified by the prefix NF as well as the aggregate size to be used. Class NF 19, for example, means a no-fines concrete with a 19mm nominal size aggregate.

The aggregate volume for every 50kg cement for each concrete class must be as follows:

NO-FINES CONCRETE	
CLASS	AGGREGATE PER 50 kg CEMENT
NF 38	0.33 m ³
NF 19	0.30 m ³
NF 13	0.27 m ³

PSG.5.3 MEASURING AND MIXING

Cement must be measured per mass or in 50kg bags. Aggregates must be measured according to leveled volumes in measuring boxes or wheelbarrows.

The quantity of water added to the mixture should just be enough to form a uniform cement paste, which will cover every aggregate particle. The mixture should be wet enough to ensure that the cement paste will converge between aggregates contact points and attach the aggregate particles to each other. The mixture may not contain more than 20ℓ of water per 50kg cement.

Mixing must be done in an approved mechanical mixer. The whole aggregate batch, together with half of the water must be placed in the mixer and mixed for at least half a minute.

The cement, together with the water, can then be added, after which another at least 1½ minutes of mixing has to follow, to ensure uniform coverage off all aggregates particles.

PSG.5.4 PLACING

The Employers Agent or Agent's Representative of the client must be given written notice by the Contractor to enable him to inspect the excavations and shuttering before casting of the no-fines concrete.

The casting of no-fines concrete has to be done continuously and may only be stopped at construction joints approved by the Representative of the client. The casting of the concrete must be controlled as such, that the time difference between successive placing does not exceed 30 minutes. All concrete must be placed within 20 minutes after being loaded in the mixer.

The concrete must be worked sufficiently to ensure the filling of all spaces and to let all aggregate particles make contact with each other.

Excessive working and tamping must be avoided and under no circumstances may the concrete be vibrated.

PSG.5.5 CURING AND PROTECTION

All no-fines concrete must be protected against the elements and, especially against strong winds, flowing water, damage to the surface and loss of moisture. Protection against moisture loss must be obtained by one of the following methods:-

By keeping the shuttering in position

By covering the exposed surfaces with bags or an approved material, which is continuously wetted.

By covering the exposed surfaces with plastic sheeting.

The spraying of water to wet the exposed surfaces continuously.

No-fines concrete placed during cold weather must be protected against frost for at least 3 days.

PSG.5.6 SEALING OF NO-FINES CONCRETE SURFACE

Where shown on the drawings, or where instructed by the representative of the client, the surface of the no-fines concrete must be sealed with 1 layer 1:8 Cement: sand mortar to prevent moisture loss from the structural concrete. The sealer must be placed after the no-fines concrete has hardened and must be finished-off level with the top of the no-fines concrete.

PSG.5.7 MEASUREMENT AND PAYMENT

No-fines concrete will be measured per cubic meter in-situ concrete cast in position. Quantities will be measured according to dimensions on the drawings or as authorized by the Representative of the client. Payment will be made for the difference classes of concrete.

The tendered rate must allow full compensation for obtaining and delivery of material; storing of material; supplying of all plant; mixing; transporting and placing of concrete; the forming of castings and cavities, construction joints (except compulsory construction joints); contraction joints; curing of concrete; repair work to defect surfaces and the finishing of concrete surfaces as specified.

The unit of measurement for the 1:8 Cement-sand mortar to seal the concrete surface will be square metres of concrete to be sealed and finished off as specified. The tendered rate must allow full compensation for the obtaining and delivery of all material, storing of material, supplying of all plant, transporting, placing and finishing of the mortar, as well as curing.

PSG.6 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:

40mm or

5mm plus the maximum of coarse aggregate, whichever is the greater.

PSG.7 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:

Remove all shuttering and boxing remaining in the holes.

Make any alterations required to the position and shape of the holes;

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.

PSG 8

UNFORMED CONCRETE SURFACES (5.5.2)

PSG.8.1

Class U1 Ordinary Finish

Immediately after placing, the concrete shall be finished by screeding with the edge of a wooden board of straight and true line and working between guides set accurately to level.

No mortar shall be added and noticeable surface irregularities caused by the displacement of coarse aggregate shall be made good by re-screeding after removing down the offending aggregate.

PSG.8.2

Class U2 Wood Float 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 1200 G. Floating shall be started as soon as the screeded finish is stiffened sufficiently, and the bleed water has evaporated or been removed and it shall be wood-floated either by hand or machine to produce a surface free from screed marks and uniform in texture.

PSG.8.3

Class U3 Steel Trowel Finish

The concrete surface shall be brought to standard of Class U2 wood floating finish with floating being continued until a small amount of mortar without excess water is brought to the surface and then when the floated surface has hardened sufficient to prevent any more excess fine material from being drawn to the surface, trowelling with a steel trowel. Trowelling shall be performed with a firm pressure such as will flatten the sandy texture of the floated surface and produce a dense uniform surface free from blemishes and trowel marks. Gradual surface irregularities shall not exceed 5mm over any 3m. The sprinkling of sand and/or neat cement on the surface to absorb excess moisture shall not be permitted.

PSG.8.4

Class U4 Power Float Finish

The concrete surface shall be first be brought to the standard of Class U1 ordinary finish using wooden screeding boards or steel rollers. After evaporation or removal of all bleed water and immediately the concrete is stiff enough to support the machine the surface shall be closed with a mechanical power float and then finished with a mechanical power trowel. The texture

of the finished surface shall be either non-slip or polished as shown on the drawings. Irregularities shall be of long wavelength not exceeding a curvature of 2mm in 600mm. Under no circumstances shall sand and/or neat cement be sprinkled over the surface either to absorb excess moisture or to fill surface blemishes or irregularities. Power floats and trowels shall be operated by skilled operators.

PSG.8.5 CURING AND PROTECTION

The Contractor should note that the moist curing is a vital factor influencing the impermeability of the concrete. Alternate wetting and drying of the concrete will not be accepted as satisfactory curing and should any concrete dry out during the prescribed period, this shall be sufficient cause to condemn the work.

Curing shall commence as soon as possible after placing of concrete without damaging the surface of the concrete and shall continue for a minimum period of 14 days.

In event of membrane-forming curing compound being proposed such compound shall be submitted to the Representative of the client for his approval, together with a technical specification as supplied by the manufacturer of the compound.

Such compounds shall be applied immediately following the final finishing operation, all in close accordance with the manufacturer's recommendations. They shall NOT be used on any surfaces against which concrete is to be bonded.

The curing compound shall conform to the following requirements:

- a) Its flash point shall be not less than 65° C.
- b) It shall be sprayable consistency at temperature above 5° C.
- c) It shall attain satisfactory resistance to rainfall within three hours.
- d) Moisture loss through the curing compound membrane per 100mm² in 7 days shall be not more than 0.031gram when checked by recognized test procedures.
- e) The curing compound membrane shall resist rupture under moderate abrasion at an age of 24 hours.
- f) The compound shall be non-toxic and shall contain a fugitive dye which shall not permanently alter the natural colour of the concrete but which shall impart sufficient temporary colour at the time of application to readily indicate the areas covered.

PSG.8.6 FLOOR SCREEDS

PSG.8.6.1 SAND CEMENT FLOOR SCREED

Sand cement floor screed must consist of a mix of 0.15 m³ of approved sand per 50 kg sack of cement. The mix must be made with the minimum water content. The thickness may vary from 10 to 30 mm. The topping must be bonded to the concrete floor. If adhesion to the concrete floor is adequate it can be laid in panels to match the panels in the floor.

PSG.8.6.2 CONCRETE FLOOR SCREED

A mix with 6.7 mm stone, sand and cement with a minimum water content must be made to obtain a cured strength of + 30 MPa . The damp mix must be applied to thicknesses as indicated on the drawings, compacted and the surface troweled by a steel trowel after adding cement and water. The water must be sprinkled onto the surface and just enough must be added to obtain a smooth surface and not to saturate the damp screed.

PSGA **CONCRETE (SMALL WORKS)****PSGA.1** **PLANT (4)****PSGA.1.1** **Finish (4.4.2)**

All exposed concrete surfaces whether internal or external shall be finished to degree II of accuracy unless otherwise stated on the drawings.

PSGA.2 **CONSTRUCTION (5)****PSGA.2.1** **Fixing (5.1.2)**

Welding of reinforcement will not be permitted.

PSGA.2.2 **Quality (5.4.1)**

All concrete used on this contract shall be strength concrete.

On the drawing's strength concrete has been designated by its characteristic strength followed by the size of stone to be used in its manufacture, e.g. 30/20 refers to a concrete of strength 30 MPa at 28 days made with 20mm stone.

PSGA.2.3 **Ready mixed concrete (5.4.1.6)**

Ready mixed concrete will be allowed in this contract.

PSGA.3 **TESTS (7)****PSGA.3.1** **Frequency of testing (7.1.2)**

The Contractor is however required to provide a minimum of 3 moulds and to make the tests. 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 **MEASUREMENT AND PAYMENT (8)****PSGA.4.1** **Concrete (8.1.3.3)****PSGA.4.2** (a) The unit rates for concrete shall include for the cost of testing.

PSHA STRUCTURAL STEELWORK**PSHA.1 CONSTRUCTION (5)**

PSHA.1.1 Add the following sub-clause:

5.5.6 **Fasteners:**

Erection shall include the supply of fasteners.

PSHA.2 MEASUREMENT AND PAYMENT (8)

PSHA.2.1 **Erection on site (8.3.3)**

Add the following:

The unit rate for erection shall cover the cost of fasteners.

PSH.3 STRUCTURAL STEEL

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). Under no circumstances will the use of commercial grade steel be accepted.

PSH.3.1 PAINTS AND PROTECTIVE COATINGS

a) SHOP PAINTING

- i. 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.
- ii. 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.

b) PAINTING AFTER ERECTION

- i. After erection all areas where the primer coat has been damaged shall be touched up as specified in PSH.2.1
- ii. 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.
- iii. 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.
- iv. The colour of the final coat shall be Light Admiralty Grey (CKS 279 no p.16), unless otherwise specified.

c) GALVANISING

Where galvanising 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/m².

d) 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.

PSH.3.2 WELDING

Delete this clause in its entirety and add the following:

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 of 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.

SITE WELDING

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.

CUTTING

No oxy-acetylene or other gas cutting and bending will be permitted on site without the Representative of the client's approval.

The Representative of the client will have no hesitation in condemning any relevant component, member or unit should oxy-acetylene or other gas cutting or bending process be carried out by the Contractor 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.

PSHA.4 STRUCTURAL STEEL WORK SABS 1200 HA (small works)**PSHA.4.1 TYPE**

The handrails shall be manufactured by an approved firm specializing in such work and shall be of steel tubing of nominal thickness 2.6 mm and of nominal outside diameter at least 34 mm.

Normal stanchions shall be manufactured preformed in one piece and shall be of nominal outside diameter at least 42 mm. The bases of the stanchion shall be pre-formed to suit the situation in which they are to be installed and the stanchion spheres shall be pre-formed to suit right angled intersection, all as given on the drawings.

Stanchions shall be spaced at intervals shown on the drawings, but in no case at intervals exceeding 1.8 m. All joints shall be welded after the erection of handrails.

PROTECTIVE TREATMENT

Treatment shall be as specified in PSH.2

IN-SITU MEASUREMENT

The Contractor shall ensure, by making in-situ measurements before manufacture is started, that the handrails suit the situation in which they are to be installed.

PSHA.4.2 LADDERS**TYPE**

Steel ladders shall be manufactured by an approved firm according to the details on the applicable drawings.

PROTECTIVE TREATMENT

Treatment shall be as specified in PSH.2

PSH.4.3 MEASUREMENT AND PAYMENT**STRUCTURAL STEEL**

The unit of measurement shall be Sum, per item as scheduled.

The rate tendered shall include for all labour, material and equipment necessary to supply, fabricate, store and erect each assembly complete and in its final position as shown on the drawings and it is to include for all holding down bolts, washers, brackets, shims and fasteners which are necessary to fix the steelwork in place as specified and which shall not be separately measured.

Protective coating of the structural steel will also be measured under this rate

PSL MEDIUM PRESSURE PIPELINES**PSL MEDIUM PRESSURE PIPELINES (SANS 1200 L)****PSL 1 Scope**

This specification covers the supply galvanised steel pipeline for rising and gravity mains.

PSL 2 Materials**PSL 2.1 Steel Pipes Fittings and Specials****PSL 2.1.1 Steel Pipes of Nominal Bore up to 150mm**

AMEND to read: -

Unless otherwise scheduled, hot dipped galvanized steel pipes and fittings of nominal bore up to 250mm shall be of heavy duty, cut grooved with flexible galvanized cast couplings and shall comply with the applicable requirements of SANS 62. Cast couplings to be rated for **40bar** with NBR gaskets, HDG grade 8.8 nuts and bolts.

PSL.2.1.2 Steel Pipes of Nominal Bore greater than 150mm

Unless otherwise scheduled, steel pipes and fittings of nominal bore over 250mm shall be manufactured to conform to SABS 719/1971 from grade 300WA steel and shall have a minimum wall thickness of 4.5mm.

PSL.2.1.3 Fittings and Specials

Add the following:

Steel specials shall be fabricated from straight steel pipe as specified in PSL.1.1.1 and PSL.1.1.2 and shall be manufactured and tested in accordance with BS 534 – Clause 4.

Where specified on the drawings or schedule of quantities, ANSI B16 curvature bends, tees and reducers shall be used.

PSL.3 Other Types of Pipes**PSL.3.1 PVC-O PIPES**

All PVC-O water pipes shall be Class 9 pipes manufactured to the following standard: ISO 16422:2014 Class 500 orientation or to SANS 16422:2007 Class 500 orientation. Bends shall be PVC-O class PN 16 or steel to SANS 719. Pipes and fittings will be tested to a pressure of 12 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.

PSL.3.2 STEEL PIPES

All steel pipes shall be to SANS 719 Grade B steel (300W) with t = 4.5 mm minimum.

PSL.3.3 STAINLESS STEEL PIPES

Stainless steel pipe shall be welded austenitic stainless steel grade PSW_304L to ASTM A312, wall thickness to Sch10s, dimensions to ANSI B36.19

PSL.3.4 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

Galvanised Restrained Steel Pipe System

Restrained steel pipes for use in 100mm and 65mm dia. bulk mains shall be galvanised 3.9mm and 3.0mm roll grooved TOSA wrap (or similar approved wrapping system) Pipe c/w cast SP coupling & petrolatum shrink sleeve joint protection respectively (as scheduled). (The piping system shall be groove-ended restrained system in accordance with SANS 815-2 as amended), Jointing of steel pipes shall be by means of Klambon RYC series SP coupling as scheduled.

The restrained piping system shall have groove ended pipe with couplings and fittings that shall comply with SANS 815-2; as amended

All pipes shall be supplied in 6m lengths with the length tolerance as per SANS 815-2-as amended

All pipes shall be galvanised in both inside and outside in accordance with SANS EN 10240.

All couplings shall be cast steel or cast iron.

All bolts, fittings and couplings shall be galvanised in accordance SANS 1461

All pipes shall be coated as indicated below;

PSL.3.5 Coating System

The coating shall be bitumen/polyolefin sleeve duplex coating, TOSA WRAP ®, or similar approved.

Approval of Batches

All raw materials as compounded in the manufacturers Quality Assurance Manual. A compliance certificate must be provided by each raw material supplier.

Bitumen/Polyolefin Sleeve Duplex Coating

Preparation and Cleaning of Pipe

i) Degreasing

Pipes shall be degreased by passing a gas flame over the surface to carbonise any contaminants.

ii) Pipe Cleaning

Pipes shall be mechanically wire brushed to Grade St.2 of ISO 8501-1 and all rust and foreign matter removed by means of blowing with compressed air, or solvent wiping.

Application of Coating

i) Outer Layer

Once the sleeve is positioned over the full length of the pipe, the heat shrinking of the sleeve is commenced one end to eliminate the risk of air entrapment. The sleeve edge is trimmed from each side of the pipe before it is transferred to the pipe inspection table.

ii) Thickness of Coating

The pipe shall be coated to a minimum thickness of 2.0mm.

iii) Method of Repairs

The area of single repair shall not exceed 10mm² the repair shall be carried out using a compatible melt stick. The number of repairs shall not exceed 3 per metre length of pipe.

iv) Performance Testing

The coating system shall comply with the following requirements:

PROPERTY	REQUIREMENT	TEST METHOD	FREQUENCY
Water Absorption of Sleeve	<= 0.1% when immersed in water at 23 ^o C for 100 days	SANS 1117	Per Project
Cathodic disbondment of Duplex system	Disbondment length <= 15mm after 28 days	SANS 1117	Per Project
Tensile strength of sleeve at yield	>= 10 MPa	ASMT 882	Per Project
Tensile strength of sleeve at break	>= 20 MPa	ASMT 882	Per Project
Elongation of sleeve at break	>= 500%	ASMT 882	Per Project
Adhesion to Steel of duplex system	> 2 N/mm	SANS 1117	Per Project
Density of sleeve	> 915 kg/m ³	ASMT D1505	Per Project
Visual	Free from visible defect	Observation	100%
Coating thickness	2.0mm	6 readings / pipe	100%
Holiday test	Nil defect @ 15 kV	SANS 10129	100%
Bond strength	> 1.5 N/mm width of strip	In house	1 per 100

PSL 3.6 Jointing Materials

Add the following:

All jointing materials such as nuts, bolts and gaskets etc. Are to be included in the respective rates for pipes and specials.

PSL 3.6.1 Flanges and Accessories

Add the following:

“All flanges shall be drilled in accordance with SABS 1123. Flanges shall be drilled to Table 16 as a minimum and shall be drilled to match the pressure rating of the adjacent fitting or pipe for pipes and fittings rated greater than 16 bar”

All buried flanges to be densely wrapped in accordance with SABS 1211, AS/NZC 4020: 1999

PSL 3.6.2 Loose Flanges

Add the following:

“Nuts and Bolts and other fasteners shall be galvanised (SANS EN 121) hexagon head type and comply with the requirements of SABS 135 – 1971 with threads of the coarse pitch series”

PSL.4 VALVES (3.10)**PSL.4.1 General**

All valves shall generally conform to SABS 664. Valves shall be class 10 with flanged end 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. Lifting lugs are to be fitted to all valves that have a mass in excess of 100kg, to be hot dip galvanized to SANS 1461.

PSL.4.2 Resilient seal gate valves

Resilient seal gate valves (RSV) shall comply with SABS 664 (latest amendment) with classes and flange drillings as detailed or scheduled elsewhere. 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. Cast iron covered with nitrile, EPDM or similar rubber

The typical application for resilient seal valves is for valves in "normally open" locations (eg air valves, isolating valves, in-line valves <250NB where the maximum differential pressure across the valve is not likely to exceed 16 Bar under normal operating conditions. Resilient seal valves shall not be used in terminal positions (e.g. as scour valves) without the approval of the Engineer.

In addition they shall comply with the following:

a) General

Gate valves shall be double flanged and be resilient seated and shall be on the non-rising spindle type.

The valves shall be capable of sealing drip tight bi-directionally over the full range of pressures from zero to maximum working pressure.

b) Gate Design

The gate shall be fully rubber encapsulated inside and out to ensure drip tight sealing and to avoid corrosion and shall be provided with a 10 year replacement warrantee. The gate shall further have a drain hole, preventing stagnant water or impurities from collecting.

Rubber utilized in the coating of the wedge shall be inert and shall not impart odour, taste and colour and shall be suitable for drinking water applications. The gate nut shall not be fixed to the wedge, thereby reducing opening torques.

c) Gate and Body Design

The gate shall have optimally placed guides of wear resistant plastic so as to reduce the torques as well as to reduce wear between the rubber and the coating on the body. The bore of the body shall be straight through design in order to allow cleaning with a badger.

d) Valve Bonnet

The valve shall utilize 3 independent bonnet seals which shall include a set of stem steels embedded in non-corrosive material, a back seal to prevent leakage when changing seals and a wiper ring to protect against debris entering the valve.

Two friction washers (sizes 50mm to 200mm) and thrust ball bearings (250mm to 600mm)

shall be incorporated to ensure smooth spindle operation as well as to reduce opening and closing torques.

e) Spindle

Spindles shall be made of stainless steel or approved metal compound. The stem threads shall be rolled to maintain steel structure and increase strength and to ensure smooth thread edges and consequently a low operating torque. The spindle seal shall consist of 2 nitrile rubber O rings located in a corrosion resistant housing. A wiper ring shall also be provided.

f) Body and Assembly

The rubber bonnet gasket shall fit in the recess in the valve bonnet preventing blow out of the seal under surge conditions. The bonnet bolts shall pass through the gasket and be sunk into the bonnet and be sealed for corrosion protection.

An edge protecting ring shall permanently be fitted around the body of the bonnet joint in order to protect the coating during transportation and installation. The body of the valve shall be fusion bonded epoxy coated to a minimum D.F.T. of 250 microns.

Unless otherwise specified caps for key operation will be required for buried valves and hand wheels on valves situated in accessible chambers. Extension spindles and brackets shall be provided where detailed and hand wheels shall be clearly marked with the direction of opening.

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. Sluice valves: Stainless steel or gun metal.

All valves shall be clockwise closing when viewed from above. The spindle in all cases shall be non-rising with a capped top.

PSL.4.3

Wedge gate valves

Gate valves shall comply with the requirements of SABS 664 (latest amendment) with classes and ends as elsewhere specified.

The typical application for wedge gate seal valves is for valves in "normally closed" locations (e.g. scour valves) and for valves in the normally open position (eg in-line valves <250NB) where the maximum differential pressure across the valve is likely to exceed 16 Bar under normal operating conditions.

Channel-guides and shoes shall be fitted to valves falling within the following pressure and size ranges:

PRESSURE	VALVE SIZE
Class 10	600mm and above
Class 16	350mm and above
Class 25	350mm and above
Class 40	All sizes
Class 100	All sizes

The spindles shall be of the non-rising type and shall be manufactured of solid stainless steel.

All valves shall be clockwise closing when viewed from above.

Gearing shall be chosen to limit the total effort at the hand wheel or valve key to 400 Newtons. The valves shall be capable of being easily operated by one man against the maximum unbalanced pressure and the total effort required to operate the valve shall not exceed 400 Newtons (i.e. A simultaneous push-pull of 200 Newtons each) on the ends of tee key 900 mm long resulting in a maximum torque of 180Nm.

In order to comply with the above requirements, it has been found that the following are normally necessary for larger sizes of valves:

- (a) Class 16 (PN 16) valves in sizes 80mm, 150mm and 300mm should be fitted with ball thrust collars; and
- (b) Class 25 (PN25) valves in size 80mm, 150mm should be fitted with either ball thrust collars or spur gears, while 250mm and 300mm sizes should be fitted with ball thrust collars and 3 to 1 gears.
- (c) Class 40 (PN40) valves in sizes 80mm, 150, 200mm should be fitted with either ball thrust collars or spur gears, while 250mm and 300mm sizes should be fitted with ball thrust collars and 3 to 1 gears.

While other forms of anti-friction devices may be acceptable it is the Contractor's responsibility to ensure that the required torque is not exceeded.

Unless otherwise specified buried valves shall be provided with caps for key operation and valves in chambers with hand wheels.

The valves shall be provided with Type B (Gunmetal) trim with pinned seat rings. The gate shall be full length. The body of the valve shall be epoxy coated to a minimum D.F.T. of 250 microns inside and out.

The gland packing shall be of the "Maxmech Style M57", "Chesterton 1724" or similar approved.

The valves are to be drop tight at working pressure.

Each valve so supplied shall be provided with a pressure test certificate.

PSL.4.4**Butterfly valves**

These shall be solid body cast iron type for bolting to flanges and shall be of perfect closure. The valves shall be fitted with gearbox operated hand wheels or ratchet locating hand-levers, stainless steel shafts and discs and natural rubber or neoprene seals and shaft seals.

The valves shall conform to the requirements of BS 5155:1984. The class of valve shall be as specified. Specifications and test certificates shall be provided.

PSL.4.5**Air release valves**

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.

All valves to be pressure rated to 1600 KPa.

Air valves shall be the double purpose air release / vacuum break type.

The air release and vacuum break valve shall be of a compact single chamber design with solid cylindrical High-Density Polyethylene control floats housed in a tubular stainless steel or corrosion protected body with epoxy powder coated cast iron, or s/steel ends secured by means of stainless-steel tie rods.

Ball type air valves are not acceptable.

The valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent re-joining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior to valve closure. Relief mechanisms that act subsequent to valve closure cannot reach in the low millisecond time span required and are therefore unacceptable.

Large orifice sealing shall be affected by the flat face of the control float seating against a nitrile rubber 'O' Ring housed in a dovetail groove circumferentially surrounding the large orifice. Discharge of pressurised air shall be controlled by the seating and unseating of a small orifice on a natural rubber seal affixed to the control float.

The intake/discharge orifice area shall be equal to the nominal size of the valve i.e.; a 150mm (6") valve shall have a 150mm (6") intake/discharge orifice.

The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. This feature shall consist of easily replaceable components such as gaskets, seals or the like.

All air valves shall be supplied with a copy of the relevant factory test certificates that reflects the test pressure and valve serial number. Original factory test certificates for each valve shall be issued on completion of delivery of the valve consignment.

Each air valve shall have a plate made of corrosion – resistance material securely fixed to the body, on which the following information shall be stamped or engraved:

- The Manufacturer's Name;
- Size of valve. e.g. : DN 100;
- Class of valve e.g.: PN 16;
- The valve serial number, which must tie up with the relevant test certificate.

End connections shall comply with SABS 1123 T1600/3 or T2500/3 as applicable and all valves will be supplied with matching flanges, gaskets and stainless-steel fasteners.

PSL.4.6

Control valves

Control valves shall comprise a centre guided diaphragm actuated globe valve of either oblique (Y) or angle pattern design. The body and cover shall be SG iron with bronze seat. The internal and external surfaces of the valve body shall be fusion bonded epoxy coated. End connections

shall comply with the drilling pattern indicated on the drawings. The body shall have a replaceable non-threaded seat ring that is held in place by a set of screws, which tighten into a body groove. This seat should be accessible and serviceable without removing the valve from the pipeline. The seat area shall have a flow opening with no stem guides, bearings or supporting ribs.

The actuator assembly shall be of the double chamber design with a separating partition between the lower surface of the diaphragm and the main valve. The entire actuator assembly consisting of the seal disk, valve shaft, bearing, diaphragm assembly, separating partition and top cover must be removable from the valve as a single unit.

The actuator assembly must be capable of accepting a V-port throttling plug by simply bolting the device to the seal disk.

The main valve, solenoid pilot, limit switch, check valve, control tubing, filter and isolation valves shall be factory assembled and tested. The valve manufacturer must be completely certified in accordance with the ISO 9002 Quality Assurance Standard.

The settings and operation of the valves shall be as described herein or alternatively as indicated on the drawings.

Prior to any valve being ordered or delivered to site, the Contractor shall deliver to the Engineer a sample of a typical control valve that he proposes to use, and which complies with this specification. The Engineer will then investigate whether the valve is compliant with the specification before authorizing the use of such valve. If the valve does not comply with the specification in all respects, the Engineer may reject such valve in which case the Contractor will have to source valves of the required quality and all costs associated therewith will be for the Contractor's account.

The sample shall be accompanied by the following control sheet:

Item	
Name of valve supply company:	
Overview of company with particular emphasis on service capabilities, calibration facilities and their track record in South Africa:	(To be attached)
Valve specification sheets (detailing compliance with this specification):	(To be attached)
Test certificate:	(To be attached)

PSL.4.7

Water meters

a) Bulk Meters (NB 40mm up to NB 300mm)

Water meters tendered for under this category must be of the in-line through-flow Woltman type, mechanical turbine flanged bulk water meters and must conform to the following dimensions and specifications:

Nominal Bore	Body Lengths	Flange Specs	Working Pressure Maximum	Temp Maximum
40mm	200mm	BS4504 Table 16	1600kPa	50°C
50mm	220mm	BS4504 Table 16	1600kPa	50°C
80mm	225mm	BS4504 Table 16	1600kPa	50°C
100mm	250mm	BS4504 Table 16	1600kPa	50°C
150mm	300mm	BS4504 Table 16	1600kPa	50°C
200mm	350mm	BS4504 Table 16	1600kPa	50°C
250mm	450mm	BS4504 Table 16	1600kPa	50°C
300mm	500mm	BS4504 Table 16	1600kPa	50°C

- All Woltman type mechanical meters supplied in terms of this contract shall perform to an accuracy of better than $\pm 2\%$ error over the meter's operating range; i.e. between Q_t and Q_p (Q_n). The performance characteristics of the meters offered must be equal to or better than the values listed below:

Size DN	Q_{start} m ³ /h	Q_{min} m ³ /h	Q_t m ³ /h	Q_n (Q_p) m ³ /h	Q_{max} (Q_s) m ³ /h
40mm	0,15	0,3	0,8	40	60
50mm	0,15	0,3	0,7	50	90
80mm	0,25	0,5	0,8	120	200
100mm	0,25	0,8	1,8	230	300
150mm	1,0	1,8	4	450	600
200mm	1,5	4	6	800	1200
250mm	3,0	6	11	1250	1600
300mm	8,0	12	15	1400	2000

- Meters must be fitted with robust glass/copper dry dial registers, which comprise 6 digit cyclometer-type totalisers, registering in kiloliters (kl) or m³. These registers must be sealed to IP68 to prevent ingress of dirt or moisture, and must function under water, in the event of manholes flooding. The registers, which are to be fitted as standard, must be able to provide one high frequency opto-type pulse output function and two low frequency reed-type pulse output functions. Only meters which allow for very easy fitment and removal of the reed- and opto-type pulsers, normally associated with data logging, without having to break the verification seals, will be acceptable;
- No consideration will be given to meter types, which necessitate the use of special tools or fitment of any form of gland in the process of connecting pulser units, or, meters which require a register-change to switch from one volume unit per pulse to another;
- Meters must preferably offer an upgrade path to AMR (Automatic meter reading), which facilitates the fitment of "intelligent" registers at a later stage. The Contractor is to provide full details of the meter capability in this regard and furnish examples of systems already operating successfully in South Africa;
- Meters must be data logger compatible with loggers which have a proven track record and have a purpose-written software, to be used in conjunction with their bulk water meters, for network management;
- Cover bolts must be of stainless-steel material to facilitate easy removal of mechanisms. Meter bodies must be coated with a high-quality sintered epoxy powder coating, both internally and externally, with a minimum coating thickness of between 200 and 300 microns;
- Although most of the meters will be installed horizontally, it must be possible to install the meters vertically (with flow in the upward direction) or in an inclined position (with flow in the upward direction), should site conditions make this necessary;
- The performance of the meters offered shall not be affected by outside magnetic influences;
- A place must be provided for on the meter body, which can be drilled and tapped, for connecting a pressure transducer, for data logging, should the need arise; and
- Ability for meter mechanisms to be exchanged – or to fit new, calibrated mechanisms into used or existing meter bodies, without loss of measuring accuracy to be substantiated. This is of particular importance to facilitate cost effective ease of maintenance to the meters in the future, without the need to remove meter bodies from the pipeline.

Prior to any meter being ordered or delivered to site, the Contractor shall deliver to the Engineer a sample of a typical bulk meter that he proposes to use, and which complies with this specification. The Engineer will then investigate whether the meter is compliant with the specification before authorizing the use of such meters. If the meter does not comply with the specification in all respects, the Engineer may reject such meter in which case the Contractor will have to source meters of the required quality and all costs associated therewith will be for the Contractor's account.

The sample shall be accompanied by the following control sheet:

Item	
Name of official local meter distribution company:	
Overview of company with particular emphasis on service capabilities, calibration facilities and their track record in South Africa:	(To be attached)
Meter specification sheets (including head loss across meter, minimum upstream/downstream straight pipe lengths and compliance with this specification):	(To be attached)
Test certificate:	(To be attached)

b) Domestic (Plastic bodied, wet dial water meters)

Water Meters used in this application must comply with the South African Bureau of Standards Specification No. 1529-1:1994 and must be approved in terms of Section 18 of the Trade Metrology Act No. 77 of 1973 and Regulation 80 of Part II of the Trade Metrology Regulations.

All meters must be tested and sealed by an authorised official in a SANAS, (SANS 0259) accredited laboratory, situated within the borders of the Republic of South Africa. The seal must include the Trade Metrology Authorisation number and copies of the test certificate must be made available free of charge on request by the Engineer.

Meters tendered for under this category must be the plastic bodied, wet dial, domestic water meters, and must conform to the following dimensions and specifications:

METER SIZE	15mm	20mm	25mm
Maximum Flow rate $q_s \pm 2\%$ (m ³ /h)	3	5	7
Permanent Flow rate $q_p \pm 2\%$ (m ³ /h)	1,5	2,5	3,5
Transitional Flow rate $q_t \pm 2\%$ (l/h)	22,5	37,5	52,5
Minimum Flow rate $q_{min} \pm 5\%$ (l/h)	15	25	35
Starting Flow (l/h)	5,7	5,7	10
Maximum Working Pressure (kPa)	1600	1600	1600
Body Length (mm)	165	165	198
Alternate Body Length (mm)	114	-	-
Pulse Output (l)	0.5	0.5	5.0

- Counter must be of a wet dial type to prevent condensation under the lens;
- Counter window of minimum 7mm thickness that cannot be penetrated, by means of a needle or similar sharp instrument in order to stop the counter from operating, without destroying the unit and allowing an uncontrollable discharge of water;
- The meter must be approved by Trade and Metrology for vertical and horizontal installation;
- The meter must be suitable for rhythmic pulsating flows with a pulse output;
- The meter must be suitable for use with water temperatures up to 50°C and a maximum working pressure of 1 600 kPa;
- The maximum rate of flow (Qs) must be achieved at a pressure drop not in excess of 100 kPa across the inlet/outlet of the meter;

- All internal plastic components to be constructed of virgin materials and may not contain any materials of scrap value;
- Each meter must be backed with a 3 year guarantee against faulty workmanship and/or materials;
- The meter supplier and/or manufacturer must have an SANS 0259 accredited laboratory and each meter unit is to be tested and sealed by an authorised official;
- Meters are to comply with a Class "C" accuracy determination;
- Meters shall have built-in non-return valves to prevent reverse flow;
- The serial number of the meter cartridge must be clearly visible from the position that the meters are normally read;
- Meters offered shall not be affected by outside magnetic influences; and
- The local meter distribution company supplying the meters to the Contractor must have a proven track record for the supply of plastic bodied, domestic meters.

Prior to any meter being ordered or delivered to site, the Contractor shall deliver to the Engineer a sample of a typical meter that he proposes to use and which complies with this specification. The Engineer will then investigate whether the meter is compliant with the specification before authorizing the use of such meters. If the meter does not comply with the specification in all respects, the Engineer may reject such meter in which case the Contractor will have to source meters of the required quality and all costs associated therewith will be for the Contractor's account.

The sample shall be accompanied by the following control sheet:

Item	
Name of the official, local. meter distribution company:	
Overview of company with particular emphasis on service capabilities, calibration facilities and their track record in South Africa:	(To be attached)
Meter specification sheets (including head loss across meter, minimum upstream/downstream straight pipe lengths and compliance with this specification):	(To be attached)
Test certificate:	(To be attached)

In spite of the requirements of SANS1529-1:2003, the Contractor must be prepared to perform the following tests in the presence of the engineer, if so required by him:

- Witness testing of a random sample of 5 meters in the test laboratory of the local meter distribution company, on the test rig normally used for the testing and calibration of these meters. Special attention will be given by the engineer to the actual performances of the meters offered, rather than the minimum performance as laid down by SANS1529-1:2003 for Class B specifications; and
- All costs associated with the above tests will be borne by the Contractor. The Employer will carry traveling costs to and from the laboratory of the official local meter distributor.

PSL.4.8

Flow control device

The device shall comply with the following:

- The device must be IP68 rated;
- The device must be capable of being interrogated, tested and re-programmed in the field using an appropriate electronic device which can be linked to a desktop and data downloaded to "Excel" for analysis;
- The device must be capable of delivering a minimum flow rate of 10 l/min;
- The device must have a minimum battery life in excess of 5 years;
- The device must be capable of delivering a preset volume of water (daily, monthly or

- as required) at full pressure;
- Daily and monthly allocation must be adjustable in field to higher/lower amounts without the need to replace any parts
- The maximum daily amount must be guaranteed (therefore must not be dependent on pressure fluctuations in the network);
- The device must be capable of withstanding a pressure of up to 10 bar;
- The device must be capable of logging the hourly consumption – over a minimum 3-month period;
- The device must have a built-in safety function which shuts off the flow in the event of the reed switch cable being tampered with or cut; and
- The device must have an option to carry-over the unused daily allocation within a month;
- The device must have security seals which prevent the uncoupling of the sensor cable from the meter pulse output;
- The device must be constructed from materials which have a very limited or no scrap value;
- The device must be able to be installed underground and to be mounted either horizontally or vertically; and
- The device must allow full bore flow (full pressure, no trickle flow)
The flow limiter units must also be capable of being supplied with a field service terminal and communication cable/probe with the following features:
- Small, robust, handheld device with high quality screen and superior battery performance;
- Associated software with various operator levels to manage field usage with confidence and have security restrictions for adjusting of flow limiter settings;
- Adjustable security settings for various operator levels;
- Ability to configure flow limiters to administrator predefined usage settings;
- Ability to configure flow limiter in-field to variable settings;
- Ability to read and store flow limiter summary and detail data and download to database;
- Allow manual meter reading recordings; and
- Run flow limiter test functions

PSL.4.9**Coatings and resistance to corrosion**

All new valves are to be epoxy coated internally and out. Coating may be either by an approved solvent-based epoxy system or an approved fusion bonded epoxy system as specified below:

Contractors will be required to submit details of their proposed suppliers, coating specification and the coating system to be applied, to the Engineer for approval, before ordering the valves.

a) Solvent Based Epoxy Coating System

The epoxy shall be of the type Carboline 891; Plascogard KSIR 88; Sigmaguard EHB; AEBECOTE 330 or similar approved.

The dry film thickness (D.F.T) shall be as follows:

- Coating: 350 microns $\pm$ 50 microns; and
- Lining: 250 microns $\pm$ 50 microns

The applied coating and lining shall comply with the requirements of Table 2.

TABLE 2: Lining Requirements

No	Property	Requirements	Test Method	Frequency
1	Visual	The lining shall be smooth, free from excessive runs, sags, orange peel, occlusion or other visible defects.	Use an experienced observer.	Each Valve
2	Coating Thickness	Minimum: 200 microns Maximum: 500 microns	SABS Method 141	Minimum 6 readings/ Valve per batch
3	Electrical Insulation Defects	Nil defects when tested at 90 Volts 2 Megaohms	SABS Method 1217 – Section 8:12	One Valve per batch
4	Degree of Cure	No softening or discolouration	20 double rubs with cotton wool swab soaked in MEK	One valve per batch
5	Adhesion	Destructive testing not recommended		

b) Fusion Bonded Epoxy Powder Coating System

The Epoxy coating shall be a fusion bonded epoxy powder coating of the type Interpon PCL 331, Vedoc V VPC 2001 or similar approved.

TABLE 3: Lining Requirements

No	Property	Requirements	Test Method	Frequency
1	Visual	Smooth glossy or semi glossy finish, free from excessive runs, sags, orange peel, occlusion or other visible defects	Use an experienced observer	Each Valve
2	Coating Thickness	Min. 200 max. 500 microns	SABS Method 141	Minimum 6 readings/ valve
3	Electrical Insulation Defects	Nil defects at 3500 Volts. For conditions for repair see Clause 3.3	SABS 1217 section 8.12.2	One Valve per batch
4	Impact Resistance	No defects at 2 joules	SABS 1217 section 8.7	Random 5% of Valves
5	Degree of cure: Dynamic Test	No softening or discolouration	20 double rubs with cotton wool swab soaked in MEK	One Valve per batch

The cured fusion bonded epoxy powder coating shall meet the requirements specified in Table 3 above.

Where extended spindles are used these shall be galvanised.

PSL.5 MANHOLES AND SURFACE BOXES (3.11)**PSL.5.1 Manhole covers and frames (Clause 3.11.5)**

Steel covers and frames and locking bars shall be as detailed on the drawings and shall be hot dip galvanized after manufacture to SANS 121 :2000/ISO 1461: 2000.

The Contractor shall submit certificates certifying that all galvanized covers and frames have been manufactured in a certified facility and meet the specifications noted above. Retention will not be released until such certificates are delivered to the Engineer.

PSL.5.2 Surface Boxes (3.11.6)**a) Domestic meter box**

The meter box shall be of an approved plastic mould design which is robust, tamper proof, has a base plate and is lockable and complies with the following:

- The locking device is to be robust and the key is to be capable of accommodating the opening torsion without twisting;
- Meterbox fittings are to be keyed into ends of box to prevent rotation on installation;
- Base plate to have drainage ports to allow water to drain;
- The box must allow fitment of meters of 115mm in length when combined with the approved flow control device. Where specified in the Bill of Quantities, boxes are also to be able to accommodate an isolating stop cock;
- The box must afford quick and easy access to perform restrictions and de-restrictions;
- Inlet and outlet fittings should be ¾" brass female connectors; and
- The lid of the box should be of high impact injection moulded plastic and must be UV stabilized.

Prior to any meter being ordered or delivered to site, the Contractor shall deliver to the Engineer a sample of a typical meter that he proposes to use, and which complies with this specification. The Engineer will then investigate whether the meter is compliant with the specification before authorizing the use of such meters. If the meter does not comply with the specification in all respects, the Engineer may reject such meter in which case the Contractor will have to source meters of the required quality and all costs associated therewith will be for the Contractor's account.

1 key must be supplied together with every 25 boxes supplied and this must be provided for in the rate for the supply of the box.

PSL.6 CONSTRUCTION (5)**PSL.6.1 LAYING (5.1)***Pipe-laying personnel*

The laying of pipes and ancillary fittings shall be performed only by a qualified person who is registered as an artisan in the plumbing, pipe fitting, or drain laying trade or who is qualified by reason of having attended and passed the course on pipe laying of the Civil Engineering Industry Training Board. The Contractor will be expected to provide proof of this requirement.

The cover to all pipes will be a minimum of 1.0 m. The cross sections of the natural ground levels must be checked before excavating trenches to ensure that the minimum cover will be maintained. All road crossings with pipes must be at least 1.2 m deep.

PSL.6.2 Pipe laid to radii (5.1.4.2)

ADD the following: -

Where rigid pipes have been indicated as being laid to radii the maximum deflection angle at any flexible coupling may be no more than 50% of that permissible deflection as specified by the manufacturer for that diameter and class coupling.

Where uPVC pipes have been indicated as being laid with radii to accommodate changes in grade or horizontal alignment these radii must be taken up over a minimum of 3 pipe lengths for deflection angles less than 9° and one extra pipe length per 3° thereafter.

PSL.6.3 JOINTING METHODS (5.2)

ADD the following: -

PSL.6.3.1 Flexible couplings

At all positions where steel pipes or specials are cast into a concrete structure in an underground position the first joint outside the structure and a joint 1m from the structure shall be made by using a Viking-Johnson or similar approved flexible coupling unless otherwise specified.

At flexible couplings the pipe ends shall be at least 10mm apart to accommodate any pipe expansion.

In all isolating, reflux and scour valve chambers at least one pipe/valve connection shall be made by means of a Viking-Johnson or similar approved flexible flange adapter coupling to facilitate the removal of the valve from the line. The coupling shall be an equivalent class to the valve or higher.

PSL.6.4 THRUST BLOCKS (5.5)**PSL.6.4.1 Thrust block size**

Thrust blocks will be required at all changes of direction, reducers, end caps, tees and where otherwise directed by the Engineer.

The Contractor may not backfill any thrust block until it has been approved by the Engineer in writing. If there is any doubts regarding the suitability of the in-situ materials at any location, the Contractor shall obtain a ruling from the Engineer prior to casting the thrust blocks.

The rate for blocks includes for all costs to shutter the blocks so that a neat product is produced. Sandbags and other means of shuttering will not be permitted.

PSL.6.5 DISINFECTION OF POTABLE WATER PIPELINES (Clause 5.10)

The disinfecting of the potable water pipeline shall be as follows:

- (a) The pipeline shall be flushed out with clean water until all sediment and other foreign matter has been removed.
- (b) The pipeline shall then be refilled with potable water containing 10 mg/litre calcium hypo chloride. Further hypo chloride shall be put into the pipeline at air valve installations to ensure an even distribution throughout the pipeline should this be necessary.
- (c) The pipeline should be allowed to stand for 24 hours and samples then taken from suitable scour points. These should contain a chlorine residual of at least 1 mg/litre. Should this not be attained further doses of calcium hypochloride shall be added to the water.

PSL.6.6 MARKERS (No reference)

The Contractor shall supply and place in position concrete markers to indicate the position of all sluice valves, air valves and hydrants. These shall be set opposite the fittings whose positions they are to indicate.

The whole marker shall be painted yellow with two coats of approved yellow road marking paint and the letters "W" above and "V", "AV" or "SV" or "IV" below as appropriate painted in black enamel. The contractor is to submit a sample for approval prior to mass producing the markers.

In addition to the above pipe route markers will also be positioned along supply routes at positions instructed by the Engineer. The marker shall generally be placed 1.5m from the pipe centre line on the LHS as seen in the direction of flow.

PSL.7 TESTING (7)**PSL.7.1 Standard hydraulic pipe test (7.3.1.2)**

REPLACE with the following: -

Subject to the provisions of 7.3.1.3 and 7.3.1.4 the test pressure for field-testing shall be 1,25 times the maximum working pressure for the class of pipe specified.

PSL.8 MEASUREMENT AND PAYMENT (8)

Please note that off cuts will not be measured (sub clause 8.2.4) and paid for. Allowance must be made in the rates for pipe laying (sub clause 8.2.1) for all off cuts etc. to position fittings and lay the pipes in the specified positions.

PSL.8.1 Supply, Lay and Bed Pipes Complete with Couplings (8.2.1)

ADD the following: -

The rate for laying shall be deemed to include for connecting pipes to existing pipes where necessary.

The rate for testing of pipelines and appurtenances shall be deemed to include for the supply and loan of temporary valves, end caps, blank flanges, isolating-type devices, buffer beams or anything else the Contractor considers necessary to complete a successful test.

PSL.8.2 Special wrapping in corrosive soils (8.2.15)

The rate for wrapping of steel pipes and specials as set out in PSL.3.4 shall be deemed to include for the packing with bitumen-based mastic and external encasing protection of joints and couplings as well as the outer protective wrap.

PSL.8.3 Lay and Bed Pipes Complete with Couplings (8.2.16)

ADD the following: -

The rate shall include the cost for checking all pipes at the stockpile, loading, transporting to construction site and offloading.

The rate for laying shall be deemed to include for connecting pipes to existing pipes where necessary.

The rate for testing of pipelines and appurtenances shall be deemed to include for the supply and loan of temporary valves, end caps, blank flanges, isolating-type devices, buffer beams or anything else the Contractor considers necessary to complete a successful test.

PSLB **BEDDING (PIPES)****PSLB.1** **INTERPRETATIONS (2)****PSLB.1.1** **DEFINITIONS (2.3)**

Add the following new definition:

PSLB.1.1.1 **Stone mat**

Material that complies with the requirements of PSLB.2.3

PSLB.2 **MATERIALS (3)****PSLB.2.1** **SELECTED GRANULAR BEDDING (3.1)**

Add the following new subclause:

PSLB.2.1.1 **STONE MAT (3.1.1)**

Stone mat shall be 13,2mm nominal size stone for concrete complying with the requirements of SABS 1083 (Category 2).

PSLB.2.2 **BEDDING (3.3)**

Selected fill material shall be used for the bedding cradle and fill blanket up to the underside of the main fill.

PSLB.2.2.1 **GRANULAR BEDDING (3.3.1)**

Add the following to the clause:

"All granular material must come from suitable borrow pits. Material from borrow pits must be tested, and results supplied to the engineer for approval prior to use.

The rate for granular material sourced from borrow pits shall include for all work to select, remove oversize and/or unsuitable material by sieving etc."

PSLB.2.2.2 **BEDDING MATERIALS (Sub clause 3.4)**

Suitable selected bedding material will generally be available from trench excavations along the route.

As also specified in sub clause 3.7 of SABS 1200 DB and sub clause 3.4.1 of SABS 1200 LB regarding the use of selective methods of excavating, the Contractor shall use selective methods of excavating and shall provide and use plant that will enable him to avoid burying or contaminating material that is suitable and is required for bedding and filling around pipes.

PSLB.2.2.3 **PLACING OF BEDDING (3.5)**

Add the following new clause:

"All bedding from commercial/borrow shall be hauled and placed along the trench at intervals not closer than 100m. The bedding material shall then be hauled with wheelbarrow from the stockpile to the trench by Labour intensive methods (LI)."

PSLB.3 CONSTRUCTION (5)**PSLB.3.1 Details of Bedding (5.1.2)**

Delete clause 5.1.2a and 5.1.2b and substitute:

"Pipes should be bedded and protected in accordance with the details shown on the relevant drawing".

PSLB.3.2 TRENCH BOTTOM (Subclause 5.2 and 5.5)**PSLB.3.3 BOTTOM IN TRENCH SUITABLE FOR GRADING TO CLASS C & D BED**

All water pipes are to be laid on a Class C bedding although construction methods for a Class D bed may be used should materials and conditions be suitable. The Contractor need not to excavate a definite depth of bedding, should the material be suitable and the in-situ material can be formed and compacted for the lying of the pipe. Payment for class C bed will therefore not take place and it will be considered as a class D bed as concerns payment only. The requirements of Class C bedding must however be met and should in-situ materials be considered unsuitable, bedding material must be imported but will not be measured and paid for.

PSLB.3.4 VOLUME OF BEDDING MATERIALS

For the purpose of calculating quantities, the volume of the material that is displaced by the pipe will be subtracted from the theoretical volume of the bedding.

PSLB.3.5 ROCK OR HARD BOTTOM

Where rock or hard ground is encountered which is of such a nature that a bedding must be excavated (which must be certified by the Representative of the client before the excavation depth is changed) for the proper grading of pipes, the Contractor will be required to trim such ground to a depth of 100 mm below the required grade of the underside of the pipe and shall use a Class A, B or C bed as instructed in writing by the Representative of the client. The excavation rates for intermediate or rock material must include this additional excavation. In special circumstances, concrete filling beneath pipes may be required, but only if ordered by the Representative of the client, in which case, such filling will be, measured and paid for at scheduled rates.

A short section of pipe is in a rocky and very difficult terrain. A steel pipe above ground level is proposed. Concrete pedestals must be constructed as "Bedding" and the pipe strapped to the supports. Details are shown on the drawing.

PSLB.3.6 CLAY BOTTOM

Where the bottom of the trench is in clayey material which, in the opinion of the Representative of the client, is unsuitable for supporting the pipe, the Contractor will be required to excavate and refill this space with selected fill material properly consolidated and finished to correct grade. The depth of excavation must be established on site with the Representative of the client before the excavating equipment leaves the position. Otherwise, the Contractor will be held responsible for all costs other than the removal of the unsuitable material.

PSLB.3.7 JOINTING HOLES

Jointing holes shall be cut of sufficient length and depth to allow for the proper making of pipe joints and shall be kept dry at all times. After the pipe work has been inspected, tested and approved by the Representative of the client, the jointing holes shall be refilled with selected fill material free from stone and then rammed to provide a continuous uniform support for the pipe work. No specific payment will be made for forming and refilling holes, the cost of which is deemed to be included in the Contract rates.

PSLB.4 TOLERANCES (6)**PSLB.4.1 MOISTURE CONTENT AND PAYMENT (6.1)**

Add the following to the clause:

“Permissible deviations of moisture content and density shall conform to Class II degree of accuracy.”

PSLB.5 MEASUREMENT AND PAYMENT (8)**PSLB.5.1 Disposal of displaced material (8.1.5)**

Amend to read:

“Material displaced by importation of material in terms of 8.1.2 shall be spread leveled and shaped to conform with the natural contours adjacent the trench. Overhaul will be paid on such material. In all cases the thickness of the material once spread shall not exceed 100mm”.

PSLC : CABLE DUCTS (SABS 1200LC)**PSLC.1 MATERIALS**

PSLC.1.1 The contractor shall install all electrical, Telkom and irrigation 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, GPO black and for irrigation, yellow. The nominal diameter is 110 mm (minimum) with an inside diameter of 95 mm.

PSLC.1.2 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.

PSLD : SEWERS (SABS 1200LD)**PSLD.1 MATERIALS**

PSLD.1.1 uPVC pipes shall be structured wall sewer pipes, class 400 or solid wall pipes, class 400 to SABS 791. Pipe sections beneath the canal sections shall be HDPE pipes class 12 to SABS 533.

PSLD.2 MANHOLES, CHAMBERS, ETC**PSLD.2.1 Precast concrete sections**

Sectional spun-concrete cylinders shall be manufactured from dolomite aggregate. The joints between ring sections shall be rendered watertight by placing a bitumen impregnated extrusion rope in each joint or a permanent epoxy past.

PSLE : STORMWATER DRAINAGE**PSLE 1: MATERIALS**

PSLE.1.1 Stormwater pipes used on site shall be precast concrete pipe with Z lock joints to SANS 677

PSLE.1.2 Skewed ends

Skewed ends for pipe culverts may be cut on site.

PSLE.1.3

Bricks

Add the following:

"Bricks shall be representative of the current bricks used on the site, complying with the requirements of SABS 227."

PSLE 2:**MEASUREMENT AND PAYMENT**

Add the following items:

"PSLE 8.2.15 : Supply and install inlet/outlet structures with complete as shown on the drawings for pipes:

(a) Up to 600 mm dia

(b) Over 600 mm dia

The tendered rates shall include full compensation for the supply of labour, plant and materials for the construction of the inlet/outlets complete as shown on the drawings."

PSME :**SUBBASE (SABS 1200ME)**

PSME.1

MATERIALS

PSME.1.1

PHYSICAL PROPERTIES

PSME.1.1.1

Subbase material

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.

PSME.2:**CONSTRUCTION**

PSME.2.1

EXCAVATION

All the subbase material will be obtained from commercial sources.

PSMJ :**SEGMENTED PAVING (SABS 1200MJ)**

PSMJ.1

MATERIAL

PSMJ.1.1

CLASS, STRENGTH AND TYPE

- a) Wheel loads in excess of 30 kN will occur
The inter-locking blocks shall be 80 mm thick , grey colour class 25 blocks.
Edge restraints will be 35/13 MPa concrete cut at 1 m intervals.

PSMJ.2

CONSTRUCTION

PSMJ-2.1

PAVING SUBJECT TO WHEEL LOADS EXCEEDING 30 kN

The paving must be locked up with at least 5 passes with a heavy pneumatic roller.

PSMK : KERBING AND CHANNELLING (SABS 1200MK)**PSMK.1 MATERIAL****PSMK.1.1 PRECAST KERBING AND CHANNELLING****PSMK.1.1.1 GENERAL**

Only precast kerbing and channelling shall be used. The standard length of a precast section shall be 1000 mm. Sections used on curves shall be 300 mm long.

PSMK.2 CONSTRUCTION**PSMK.2.1 PRECAST CONCRETE KERBING**

The expansion joints shall be as indicated on the drawings but on curved kerbing the maximum distance between expansion joints shall be 3 m.

PUMPING PLANT & EQUIPMENT**PME/1 : PROJECT AND GENERAL SPECIFICATIONS****PART 1 GENERAL****1.01 SCOPE OF WORK**

The scope of the work is the manufacture, supply, delivery, installation, testing, commissioning, maintaining and guarantee of the following pumping plant and equipment as per the following specifications :

1.01.1 Margate Sewer Pump Station 1 :

- Disconnection and removal of the existing submersible sewer pumps and deliver to UGU stores
- Supply and installation of new immersible 3 sewer pumps with a duty of 19,36l/sec at 17m head each with stainless steel impellor and shaft complete with sensors, cabling etc as supplied by API Grundfoss Pumps or similar approved. The 2 installed pumps shall be 1 duty and 1 stand-by. One pump shall be a spare and stored at the UGU stores
- Supply and installation of one submersible sump pump with a duty of 5l/sec at 10m head (TBC) with automatic float control to be installed in in a 500x500x500deep sump in the dry well. The pump will be used to pump out any spillages or leaks from dry well back into the wet well and is to include all HDG discharge pipework (max 10m) , NRV and all fittings complete.
- Supply and installation of pressure gauges
- FAT and SAT for the main pumps to be included
- Testing and commissioning of all the pumping systems and assisting with testing of the main sewer rising main pipeline
- Provide O & M manuals

1.01.2 Margate Sewer Pump Station 1A :

- Disconnection and removal of the existing submersible sewer pumps and deliver to UGU stores
- Supply and installation of new immersible 2 sewer pumps with a duty of 11,67l/sec at 32m head each with stainless steel impellor and shaft complete with sensors, cabling etc as supplied by API Grundfoss Pumps or similar approved. The 2 installed pumps shall be 1 duty and 1 duty assist.
- Supply and installation of one submersible sump pump with a duty of 5l/sec at 10m head (TBC) with automatic float control to be installed in in a 500x500x500deep sump in the dry well. The pump will be used to pump out any spillages or leaks from dry well back into the wet well and is to include all HDG discharge pipework (max 10m) , NRV and all fittings complete.
- Supply and installation of pressure gauges
- FAT and SAT for the main pumps to be included
- Testing and commissioning of all the pumping systems and assisting with testing of the main sewer rising main pipeline
- Provide O & M manuals

1.01.3 Margate Sewer Pump Station 3A :

- Disconnection and removal of the existing submersible sewer pumps and deliver to UGU stores
- Supply and installation of new immersible 3 sewer pumps with a duty of 108,67l/sec at 50,27m head each with stainless steel impellor and shaft complete with sensors, cabling etc as supplied

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- Grundfoss Pumps or similar approved. The 3 installed pumps shall be 1 duty, 1 duty assist and 1 stand-by.
- Supply and installation of one dewatering pump diesel motor driven portable canopy type. Duty and head to be confirmed (to match existing dewatering pump as used by UGU) as supplied by Selwood or similar approved. The pump will be used to pump out the wet well when the main pumps fail or during flood conditions to pump into the rising main or tankers. To include all HDG discharge pipework (max 10m) with hoses , couplings , NRV and all fittings complete.

The new pumps are to match the existing pumps which are Selwood S150 self-priming with diesel engine type HA494 - 48,57kW rating, speed at 2300 RPM to BS5514 standards.

Alternatives to include Gorman Rupp V6 self priming type, Kirloskar self priming engine pump or API Grundfoss type to match the duties of the above Selwood pump

- Supply and installation of pressure gauges

- FAT and SAT for the main pumps to be included
- Testing and commissioning of all the pumping systems and assisting with testing of the main sewer rising main pipeline
- Provide O & M manuals

1.01.4 Margate Sewer Pump Station 4A :

- Disconnection and removal of the existing submersible sewer pumps and deliver to UGU stores
- Supply and installation of new immersible 3 sewer pumps with a duty of 204,04l/sec at 42m head each with stainless steel impeller and shaft complete with sensors, cabling etc as supplied by API Grundfoss Pumps or similar approved. The 3 installed pumps shall be 1 duty, 1 duty assist and 1 stand-by.
- Supply and installation of one dewatering pump diesel motor driven portable canopy type. Duty and head to be confirmed (to match existing dewatering pump as used by UGU) as supplied by Selwood or similar approved. The pump will be used to pump out the wet well when the main pumps fail or during flood conditions to pump into the rising main or tankers. To include all HDG discharge pipework (max 10m) with hoses , couplings , NRV and all fittings complete.

The new pumps are to match the existing pumps which are Selwood S150 self-priming with diesel engine type HA494 - 48,57kW rating, speed at 2300 RPM to BS5514 standards.

Alternatives to include Gorman Rupp V6 self priming type, Kirloskar self priming engine pump or API Grundfoss type to match the duties of the above Selwood pump

- Supply and installation of pressure gauges
- FAT and SAT for the main pumps to be included
- Testing and commissioning of all the pumping systems and assisting with testing of the main sewer rising main pipeline
- Provide O & M manuals

1.01.5 Pump supplier to confirm and provide the following :

- Full technical details, pump curves and brochures, weights, dimensions etc for the immersible pumps and sump pumps are to be submitted with the tender
- The technical data sheets Annexure A at the back of this specification is to be completed and submitted for each pump station or for the each different type of pump/s
- The following are required for the dewatering pumps:
- Full technical details, pump curves and brochures for the pumps
- Pump supplier to confirm pump duties and head and if these capacities or duties are achievable. Clarity is to be discussed/confirmed with the Engineer before submission of tenders
- Type and dimensions of pump suction and discharge and other fittings
- Full technical details for the diesel driven motors
- Type of motor starting and controls
- Type and number of batteries
- Type of motor cooling
- Capacity of diesel tank and calculated run hours on full load
- Type of enclosure for the set
- Net weight and dimensions for the set complete
- Details on how the unit will be moved around (ie does it come on trailer etc)
- All other details or information the pump supplier deemed necessary to submit

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- Note that the above details will be used in the evaluation of the tenders submitted

Note :

a) Preferred supplier of immersible / submersible pumps to be API Grundfoss pumps to suit Client requirements. All alternatives must be approved prior to tenders closing

b) Alternatives will be considered for the following types of pumps, but only after approval by the Engineer and Client :

- KSB (second preference)
- ABS (Sulzer)
- Hidrosta
- Kirloskar Pumps

NB : The supply and installation of all pipes and fittings , isolations valves , non-return valves etc is excluded from the pump supply and will form part or other specialist scope of work.

1.01.6 Immersible Pumps – General

- The immersible pumps shall be type API Grundfoss or similar and equal approved. The pump duties are as specified above
- The motors shall be minimum IE3 efficiency Class H insulation, 1485 RPM 4 Pole (preferred) and must be fitted with cooling jacket.
- Pumps are to be non-self priming, single stage centrifugal immersible type designed for pumping large volumes of un-screened sewer or wastewater with non-clogging self cleaning semi-open channel or open vortex type impeller capable of handling solids of up to 80mm in size
- The pumps will operate on a duty, duty assist and stand-by basis as specified above. The stand-by pump shall be automatically activated should the duty pump fail. However both pumps can operate simultaneously should the level in the sump rise faster than the set points.
- The use of double, back to back mechanical seal in oil is preferred. Mechanical seal or seal cavity in wet end will not be accepted.
- The pump shall include the following :
 - Stainless steel impeller - Diameter to be specified and selected by supplier to meet the duty points
 - Discharge diameter - Diameter to be specified and selected by supplier
 - Inlet diameter - Diameter to be specified and selected by supplier
 - Installation type - T Vertical permanent dry
 - Max fluid temperature - 40°C
 - S1 Duty
 - Speed 1485 RPM (preferred)
 - Full load PF - Best PF to be selected and specified by supplier
 - Efficiency at full load - Best efficiency at duty point to be selected and specified by supplier
- Pumps shall be supplied with integral 400Volt 50 Hz motor with cables of 25m lengths

capable of reaching the MCC and drives. Cables to be sized for maximum volt drop of 0,5%

- Pumps shall be operated on VSDs. Motors shall be selected and wired accordingly
- Duty pumps operated independently via levels in the sump/reservoir
- Pumps shall be provided with guide rails manufactured from grade 316 stainless steel
- All bolts, nuts , washers etc shall be stainless steel Pumps shall be fitted with water-in-oil sensors
- Pumps shall be fitted with moisture sensors
- Pumps are to be fitted with 3 (three, one per phase) thermal PT100 sensors for protection of motor winding temperature overheating
- All sensors shall be supplied complete with built-in cables of 25m lengths capable of reaching the MCC and drives OR cable junction boxes
- Details of the pump casing, impeller, motor casing and all other information etc shall be provided in the attached annexures to be provided by the pump supplier. 1.02 DESCRIPTION
-

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- Pumps shall be submersible wastewater type pump(s) and immersed with watertight and totally encapsulated electrical 3-phase induction motor non-overloading type for S1 rating

under maximum demand conditions, prepared for operation at a supply voltage of 400 volts 50 Hz. complete with adequate length of submersible rubber cable (EPDM-based)

- The cable/s shall be sized to match the electrical consumption of the motor running at full load and dimensioned according to the latest IEC 60335-1 standard.
- Pump/s, motor/s and drive/s shall be rated for continuous duty and shall be capable of pumping the flow range specified.
- The pump/s shall meet the maximum allowable shut-off head and not overload the motor/s at any point on the maximum pump speed performance characteristic curve and the pump/s operating range, within the limits of stable pump/s operation, as recommended by the manufacturer, to prevent surging, cavitation and vibration.
- Hydraulic surges and transients shall be determined during the design of the pump station and hydraulics analysis. The rising mains and the design of all relevant components shall take these pressures into consideration. The design shall take cyclic fatigue due to cyclic pressures (starting and stopping of pumps) into

consideration and shall be in accordance with the pump and motor manufacturer's recommendations and shall not operate for extended periods beyond these normal recommended ranges.

1.03 SCOPE

- The pump/s shall be designed, manufactured, selected and equipped with accessories suitable for the purpose, the duty and operation of the entire system.
- The pump/s shall be tested and commissioned for the purpose the product is intended.

1.04 REFERENCE STANDARDS

The following standards are referred to in this Clause :

For 50 Hz pumps

- Machinery Directive (2006/42/EC). Standard used: EN 809: 1998 + A1: 2009.
 - Low Voltage Directive (2014/35/EU). Standard used: EN 60204-1: 2006 + A1: 2009.
 - EMC Directive (2014/30/EU)
 - ATEX Directive (2014/34/EU)
 - Standard of enclosure class (IP) (IEC 60529).
 - Referenced vibration standards: ISO5199:2002 and ISO10816
 - DIN flange standard (EN-1092-2): Pressure stage PN 10
- 2.01 DESIGN & PERFORMANCE CONDITION

PART 2 PRODUCT

- The pumps selected are to ensure that the specific duty point falls within the best efficiency performance/near the maximum efficiency point on the pump's characteristic curve, within the pump's recommended operating range and within the manufacturer's recommended limits for radial thrust and vibration.
 - The pumps shall be designed and constructed to operate in a media temperature of maximum 40°C (104°F) and in the operating conditions they are designed for.
 - The pumps shall be designed for a life of 100,000 operating hours given the recommended service intervals stated by the pump manufacturer.
 - Drive end bearings shall be angular contact type, preferably double row C3 type with an expected bearing life of 50 000 hours
 - Pumps vibration levels shall refer to the principals stated in the ISO 5199:2002 and ISO 10816-7:2009 or ANSI/HI 11.6:2012 standards [use one].
 - The immersible pumps when established on a discharge connection and operated in the system shall be free of leakage in the discharge connection. The pump/s shall be installed according to pump supplier recommendations in respect distances between intake and ground floor, sidewalls and minimum water levels to ensure cavitation caused by either surface or submerged vortices is eliminated over the full area of operation.
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- The construction should be designed so dismantling, servicing and re-installation can be accomplished easily.
- The controls and starting/drive equipment shall be suitable for use with the pump/s motor/s, taking into account all requirements including start torque and starting currents and number of starts per hour.
- For the performance curve of the selected pump impeller, the head shall continuously rise as flow decreases throughout the entire curve from run out to maximum allowable shutoff head.
- Pumps shall be with an uncompromised free spherical passage through the pump hydraulics. The minimum free spherical passage through the pump shall be minimum 80-mm in diameter.
- The pump(s) shall be tested in test facilities standardized according to ISO 9906:2012 Grade 3B or ANSI/HI 11.6:2012 grade 3B with regularly calibrated instruments. Based upon selected test grades according to above standards, the manufacturer shall guarantee the following parameters:

- Flow rate
 - Total head
 - Power input
 - Efficiency
- ### 2.02 SYSTEM OVERVIEW

- The pump system shall be fabricated in accordance with the following requirements:

1. For pumps installed on auto-coupling system, the pumps shall utilize a guide rail system with dock foot bend to permit easy removal and reinstallation without dewatering of the pump sump.
2. Discharge connections to be established automatically with a simple downward motion when the pump is lowered into operating position by the guide rail system. The pump(s) shall be capable to be removed without disconnecting any fasteners.
3. An appropriate length of chain or lifting system shall be connected to the lifting device of the pump to permit raising and lowering of the pump.

Pump/s should be selected with impellers according to the required application and shall be fabricated according to the rated motor size as follows:

IMPELLERS

For pumps fitted with channel impeller

1. The pump shall be equipped with tube-shaped channel impeller without guiding vane coupled directly to the motor shaft. The design of the channel impeller shall be smooth leaving no obstructions or dead zones while being capable of handling a dry solids content up to 3%.
2. The suction clearance between impeller and pump casing in channel impeller pumps shall be either adjustable or replaceable to ensure a trouble-free operation. Adjustment of suction clearance shall be maintained in accordance with the supplier's specification.

For pumps fitted with vortex impeller

For pumps fitted with vortex impeller, the pump shall be equipped with a symmetrical multi vane vortex impeller fitted with winglets designed for dry solids content up to 5%. The design must ensure flow entirely outside the impeller providing limited contact between the impeller and the pumped media. This will ensure that long fibres, rags and more blockage materials will pass freely through the pump without being caught and without causing clogging or jamming incidents.

To reduce vibrations and the load on the shaft seal faces, shaft and bearings to a minimum, the impeller must be impellers that are dynamically balanced to ensure that the impeller is in

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shall be in accordance with ISO 1940.

Discharge Connection and Guide Rails shall be fabricated as follows:

1. Pumps above 15 kW/20 Hp shall be mounted on a foundation to reduce vibrations to a minimum. The discharge elbow shall be fixed to the bottom of the pumping station having a mass of minimum 3 to 5 times the mass of the pump. The foundation shall, besides the above recommendations be constructed to obtain the total weight of the machine installation and water in the system.

Performance curves and factory testing:

1. For the pump(s) in question, the pump manufacturer shall supply a complete performance curve document in a readable size.
2. All performance curves shall be according to ISO 9906:2012 Grade 3B or ANSI/HI 11.6:2012 grade 3B and the curves shall be documented in a test report delivered with the pump/s specified.
3. Performance and system curves of the pumps shall be supplied with a readable large scale, which shall show the capacity of the pumps under single and multi-pump operation at the duty point/s
4. When tested at the manufacturer's facility, the pump(s) shall be tested based on system specific duty points (on request)
5. The pumps shall be factory tested prior to dispatch to site. Where requested, the Engineer and Client shall be invited to witness such tests and accept same. All costs for same shall be to the pump supplier's or contractor's costs. 2.03 PUMP/S
- 6.

Castings, fabrications, machined parts and drives shall conform to the industry standards for strength and durability and shall be rated for continuous duty over the entire operating range with selected materials according to waste water industry specifications.

. Pumps shall be manufactured of the following materials as a minimum

1. Volute castings shall be cast iron grade not less than EN-GJL-250 or ASTM A48 Class 40B (or as indicated on the returnable schedule)
2. Suction cover shall be Cast iron grade not less than EN-GJL-250 or ASTM A48 Class 40B
3. Bends shall be Cast iron not less than EN-GJL 250 or ASTM A48 Class 40B.
4. The suction and outlet of the pump shall not be smaller than 100mm to prevent clogging at low hydraulic speeds
5. Motor casing shall be Cast iron not less than EN-GJL1050/ A48 30). (or as indicated on the returnable schedule)
6. For frame sizes 50 to 62 shafts shall be stainless steel grade. (EN 1.4460 or AISI 329) .

For frame sizes 66 to 78 shall be High tensile steel (EN 1.7225) or optional Stainless steel (EN 1.4460 or AISI 329) .

1. Fasteners shall be stainless steel grade no less than EN 1.4401 or AISI 316.
2. O-rings shall be NBR rubber.
3. Shaft seal shall be a single unit double mechanical seal of the cartridge type. The seal faces of the primary shaft seal shall be silicon carbide/silicon carbide (SiC/SiC) and the seal faces of the secondary shaft seal shall be either carbon/ceramics.
4. The duckfoot seal shall provide for sealing between the slide shoe and duckfoot bend

. The pumps shall be fitted with flanges according to EN 1092-2 / ASTM/ANSI B16 125 lb Class – EN 1092-2 (50Hz and 60 Hz DIN pumps) or ASTM/ANSI B16 125 lb Class (60 Hz ANSI pumps)
Page 7 of 14

. For pump/s that are to be installed and operated partly submerged installation shall be equipped with cooling system

. For pumps that are to be installed and operated fully submerged: The pump/s can be equipped without a cooling system or cooling jacket.

. Bearings shall be greased for life and designed for a minimum of 50 000 service hours at the best efficiency point (BEP).

. Painting and surface preparation: Surfaces shall be sand-streamed at standard grade of cleanliness Sa 2 ½ and the surface painting shall be two component epoxy coating to a dry layer thickness of min. 150 microns. The final paint colour is to be confirmed prior to manufacture of the pumps. 2.04 ELECTRIC MOTORS

1 Conversion to other standards such as AISI/ASTM is normative, and products are not manufactured according to these standards and codes.

. The motors are to be standard immersible/submersible type for LV Motors and electrical installations where applicable and comply to the Municipality requirements or relevant SANS,ISO,IEC,BS standards etc

. All motors shall be suitable for operating at a power supply of 400Volts, 50 Hz, 3 phase, AC supply. Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions.

- Variation of supply voltage from the rated motor voltage +/- 10%
- Variation of supply frequency from the rated frequency +/- 2%

The motors shall not be overloaded at any point of the performance curves. The pump/s shall have a service factor of 1.10 (+10%) in 50 Hz – and 1.15 (+15%) in 60 Hz applications.

- All motors shall be capable of starting as follows :
- Frame size 50 - 70 max. 20 times per hour.
- Frame size 72 max. 15 times per hour.
- Frame size 74 – 78 max. 10 times per hour.

For this project the motors shall be started for a maximum of 10 times per hour.

• Motor/s shall be capable of starting up and operate in the event of a completely flooded pumping station and shall be IP rated as required. Motors shall be selected to meet the maximum power required for the selected

impeller at all operating conditions.

- The pump/s motor/s shall be configured suitable for variable speed drive/s. This is a requirement.
- Motor/s shall be capable of starting and accelerating the load with the applicable method of starting without exceeding the acceptable winding temperatures, when the supply voltage is in the range of 10% above of the rated motor voltage.
- Motor/s shall be designed to withstand 120% of the rated speed for two minutes without any mechanical damage in either direction of rotation.
- The insulation class of motor winding shall conform to class – F (155°C/311°F)

Frame size 50 – 72 Temperature rise class F (105K)

Frame size 74 – 78 Temperature rise class B (80K)

- Pump motor/s shall be water-tight totally encapsulated type, protected to IP68. (IEC 60529).
- Motor/s cooling must be achieved by a cooling jacket, using the pumped media to cool the motor/s. The pump impeller must be equipped with a system to ensure a pumped flow of

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- fibers, hair and foreign material.
- The motor shaft shall be of large diameter, lightly stressed to ensure rigidity, with impeller and bearing location shoulders and a keyway for location of the impeller.
- The motor windings shall be protected with a waterproof material and shall incorporate a thermal sensor in each phase to safeguard against high winding temperatures. The thermal sensor shall be connected into the control circuit of the starter and signals taken for continuous monitoring of winding temperature.
- The motor shall incorporate a cut-out device to detect the presence of any liquid, moisture or oil in the motor enclosure and, in the form of non-resetting moisture or oil switch to ensure that the cause of leakage is detected and repaired.
- The terminal connections for the power and protective circuits shall be housed in a completely sealed and waterproof junction box, complete with all external corrosion resistant cable glands.
- The pump unit/s shall be provided with power and protection circuit cables of sufficient length to reach from the motor junction box to the local isolator or motor control panel, located at the access level.
- The power cable shall be 600/1000V grade flexible stranded copper wire, insulated and overall sheathed with under-water grade compound flexible insulation. The cable/s shall be rated to take the full motor current under the prevailing liquid and ambient temperature conditions.
- If variable speed drives are used, the motor should be equipped with isolated bearings and screened cable.
- Base plates shall be manufactured from mild steel plate of adequate thickness and be hot dipped galvanized to SABS1463. The base plates must allow the pump and motor to be easily removed without removing any part of the suction or delivery pipework.

2.05 PAINTINGS, SURFACE PREPARATION AND LABELS

Coatings and Surface Protection shall be provided as follows:

- All parts of the pump and motor shall be 100% holiday free epoxy coated and the process followed should be in line as stated below:

1. Cleaning: Sand blast SA 2 ½ at the foundry
2. Grease and rust removing with solvent
3. Primary paint layer: Epoxy 40 microns at foundry

4. Finishing paint layer: Dry film thickness 150 microns
5. Paint: Temacoat HB 30, two-component resin modified epoxy paint or similar and equal approved as supplied by the manufacturer
6. Colour: Graphite Grey (NCSS 8005-R80B) (to be confirmed prior to manufacture)

. Labels 2.06 CONTROLS, SENSORS & MONITORING (Refer to electrical specifications for more details)
.

Industry standard engraved durable name plate labels shall be firmly fixed to the pumps and motors indicating all data, specifications and information of the pumps and motors.

The labels shall be made of aluminum plate and be clearly legible.

The pumps shall be provided with proprietary monitoring and control units for inclusion in the motor controls supplied strictly by the motor control panel manufacturer. In certain instances, they shall be included by the pump manufacturer. (where specified) Page 9 of 14

A. Analog inputs shall include the following:

1. Winding temperature
2. Water-in-oil monitoring

B. Digital inputs shall include the following:

- 1 High winding temperature
- 2 Seal Monitoring
- 3 Over temperature
- 4 The controller with the PLC and VSDs must be able to provide the functionality and control of the pumps and motors as specified under the electrical and control section of the project specifications.

2.06 INSPECTION & TESTING

Each pump shall be tested at the manufacturer's premises for the full operating range of the pump. The testing of the pump shall be done according to a testing standard that is equal to ISO 9906:2012 Grade 3B or ANSI/HI 11.6:2012 grade 3B .

Tests shall be carried out at rated speed with minimum NPSH available at site. Pump performance shall be within the tolerance limits specified in the above test standards.

To ensure proper operation of the pumps, the pump contractor shall test and adjust all equipment after construction is completed. Pumps and motors shall be aligned and balanced on site as per the manufacturer's specifications/recommendations

The pump manufacturer shall supply a test report of the pump specified or selected.

Where specified/required, the factory pump performance test for each pump type shall be carried out at the supplier's or manufacturer's premises and is to be witnessed by the Engineer and Client for conformance and acceptance. The costs (flights , travel , accommodation, meals etc for the Engineer and Client) etc shall be borne and paid by the pump supplier or contractor.

The pumps shall be tested on site (SAT) , with the manufacturer or supplier being present to test the pumps in the presence of the Client and Engineer. The SAT of the pumps is to be verified and confirmed against the specifications and duty of the pumps. The SAT tests shall be recorded in a well documented format.

2.07 DOCUMENTATION

Submittals for approval: The pump manufacturer shall also provide the following for approval.

1. Pump Data Sheets
2. Pump civils and building requirements and layouts including any holding down bolt details
3. Performance curves
4. System curves
5. Pump CAD drawings.
6. As built drawings and layouts
7. Installation and operating instructions
8. Pump testing and commissioning data sheets

9. Operating and maintenance manuals (O & M manuals) - 5 copies in both hard and soft copies

The O & M manuals shall comprise the following as a minimum, only the relevant portions applicable to the specific scope of work shall apply :

- 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

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- 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 device 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 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
- Training shall be provided to the Client's operational and maintenance staff

PART 3 EXECUTION

3.01 INSTALLATION AND TRAINING

- The equipment shall be installed in accordance with the manufacture's installation and operating instructions.

- The pump supplier and contractor shall provide training for the plant or facilities operations and maintenance personnel. Allowance shall be made to train four persons.

•

- The equipment/system warranty, unless otherwise stated, shall be warranted to be free of defects in material and workmanship for a period of 12 months from the date of installation, but not more than 24 months from the date of manufacture.

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- To ensure a valid warranty, all pump sets shall be supplied directly by a manufacturer or by a duly authorized and licensed supplier who shall provide the manufacturer's warranty and services for the pump sets.

3.03 SPARE PARTS & TOOLS

The manufacturer shall be able to provide:

- A list of recommended spare parts
- All service tools
- Instructions of how to service and maintain the pumps and associated equipment specified
- Instructions of how to service and maintain the pumps and associated equipment specified

PME/2 : PROJECT AND GENERAL SPECIFICATIONS – PUMP PIPEWORK AND FITTINGS

Pipework, valves and associated fittings shall form part of a separate scope of work. Page 12 of 14

ANNEXURE – A**RETURNABLE SCHEDULE**

(COMPULSORY – COMPLETE ONE FOR EACH PUMP TYPE AND SUBMIT / RETURN WITH TENDER)

Typical Pump Data Sheet - MARGATE SEWER PUMPS :

PUMP STATION No:... Contractual Duty Point specified

Number of pumps required No

Type of pump

Manufacturer of Pump

Country of Manufacture

Make and Model of Pump

SANS, BS , ISO or IEC Standards the pump is
manufacture toType of impeller (state whether open, single-port, two-
port or shrouded)

Number of impellers/ stages No

Size of solids which can mm
pass through the pump in
normal operationMass of fully assembled kg
pump (and motor)Maximum allowable operat- RPM
ing speed of pumpSpeed of pump at the speci- RPM
fied duty point above

Diameter of impeller offered mm

Will the impeller offered ena- State YES or NO
ble the pump to meet a
duty point ranging from:-----m³/hr x----- m to-----m³/hr x ----- mFactory test pressure appli- kPa
cable to pump with
suction and delivery flanges
blanked offPump efficiency at Duty %
PointHead developed by pump at m head of
zero discharge water

Closed valve head of pump m

Moment of inertia of rotation kgm²

assembly

Power Absorbed

Power absorbed by pump at kW
specified Duty Point

Power absorbed by pump at kW
a run point of 810 m³/hr

Power absorbed at best effi- kW
ciency point:

Maximum power absorbed kW
by pump at run out point of
coupling

Voltage (V for all Volts
pumps)

NPSH

NPSH requirement at speci- m head of water
fied Duty Point

STANDARD GENERAL ELECTRICAL & INSTRUMENTATION SPECIFICATIONS PUMPING AND WATER TREATMENT SYSTEMS

GS.1 STANDARD SPECIFICATION FOR DB's AND MOTOR CONTROL CENTRES

All major motor control centres and equipment shall be designed in accordance with SANS 1473/60439. The equipment shall conform to SANS 60947 Parts 1-7, unless otherwise stated and shall be suitable for operation on supply voltages of 230/400 Volts and 500/550 Volts, 50Hz, AC. Reference SHALL be made to the detailed technical specification, the relevant line diagram if provided, as well as the following specific requirements.

In addition the design must conform to the following standards:

- Act No. 85 of 1993 Occupational Health and Safety Act.
- SANS 10142 Code of Practice for the Wiring of Premises
- Relevant SANS specifications and Codes of Practice
- Relevant BSI Specifications and Codes of Practice in the absence of published SANS documents.

Relevant IEC Specifications and Codes of Practice shall be used in the absence of published SANS and BSI documents.

GS.1.1 CONSTRUCTION OF MOTOR CONTROL CENTRE ASSEMBLIES

All motor control centres shall generally be of the free standing, floor mounted, individual starter with local isolator for each motor type, with front and back access, suitable for bottom cable entries from cable trenches below the assembly. The schematic drawings or project specification show the specific requirements applicable to each assembly. In certain instances wall mounted control centres may be required as specified.

The assembly will be constructed of powder coated 3CR-12 having a minimum thickness of 2mm except for gland plates which shall be a minimum of 3mm. If thinner material is offered, offered, the construction technique must be approved by the Employer's representative prior to fabrication.

Where specified the assembly enclosure may be required to be manufactured from stainless steel.

The degree of protection shall not be less than IP 43, in accordance with SANS 1222 and capable of withstanding the temperature, humidity and conditions normally associated with heavy industrial applications. The assembly shall be fully vermin proofed.

A hot dipped galvanized steel base frame shall be provided and removable lifting eyes with blanking off plugs shall be provided for heavy assemblies. All panels shall be suitably braced to ensure rigidity.

The MCC's are to be fully assembled in the manufacturer's factory for final acceptance tests. Where broken down for transportation to site, the MCC's will be provided with all items required for re-assembly. Provision must be made for future extension at either side of the MCC. All holes provided for such extension to be suitably plugged or covered. Page | 2

The overall outside dimensions of the assembly shall be suitable for easy handling of the switchgear. The height of the assembly shall generally not exceed 2100mm above floor level.

All doors shall be fitted with stainless steel or heavy duty rustproof hinges of Barker & Nelson or Zeus manufacture and shall be secured in the closed position by means of locking devices of approved quality. Doors in excess of 450mm height shall be secured at both the top and bottom. Lockable catches are required on all doors. All doors are to be fitted with earth straps.

Covers, other than the hinges type, shall be provided with chromium plated handles to facilitate removal. Removable covers shall be secured in position by means of patent screw locking devices approved by the Employer's Representative. All the equipment shall be mounted behind the doors and neat machine punched openings shall be provided for the purpose of operating handles etc. Employer's Representative's drawings or specifications will detail the instruments required which will be flush mounted. The positions of instruments shall be such that the glass cannot be broken by other equipment when the doors are in the fully open position.

Cut outs which are provided for future equipment and instruments shall be neatly blanked off by means of removable dummy frames. Back plates shall be provided in all spare cubicles for the specified future starters.

The manufacturer's detailed working drawings of the assembly must be approved by the Employer's Representative or Engineer before any fabrication commences. Any other construction or type of assembly proposed as an alternative to that specified, must have the approval of the Employer's Representative in writing. The drawings will detail all dimensions of busbars, connections, electrical components, make, type and rating. Position and layout of busbars, earth bars and gland plates must be shown in front and side elevation drawings.

GS.1.2 PAINT SPECIFICATION

In general, the following standard colours shall be used, but the final colours are to be confirmed with the Employee's Representative.

Non-essential section Electric orange (Colour B26 – SANS 1091) Essential sections Signal red (Colour A11 – SANS 1091) Uninterrupted power (UPS) Electric orange (Colour B26 – SANS 1091) Instrumentation and control Electric orange (Colour B26 – SANS 1091)

GS.1.3 BUSBARS

All busbars shall be manufactured from solid high conductivity copper and shall comply with the requirements laid down in SANS 1195. The completed busbar system shall be a standard modular system and shall have been tested to SANS approval and a certificate shall be made available confirming the full busbar technical description, current rating and fault rating together with full details of the test results.

The busbar assembly shall be rated in accordance with the specified ultimate projected faulted level, which will be not less than the short-circuit stresses limited by the protective device(s) on the supply side of the busbars, as well as the specified continuous full load current, with a current density not exceeding 1.60 Amps per mm².

The busbars shall be continuously rated for the specified current with a maximum temperature of 40°C relative to a peak ambient temperature of 40°C giving a maximum peak busbar temperature of 80°C.

Busbars shall be mounted in the top section of the assembly and shall be rigidly supported by means of approved insulated busbar clamps to prevent damage resulting from the specified short circuit conditions.

The busbars shall run along the entire length of the assembly up to 76mm from either end. The phase busbars shall be identified in the phase colours red, white and blue.

The busbars shall be arranged horizontally with the longer side of the cross-section in the vertical Page | 3

plane and one behind the other in the horizontal plane. The minimum clearance between live conductors and live conductors and earth shall be 40mm.

GS.1.4 BUSBAR DROPPERS

All busbar droppers must be suitably supported and braced to suit the specified and/or project short circuit conditions. They should be fully insulated and screened against accidental contact.

The droppers to the supply side of a single functional unit, as well as the components included in this unit, may be rated on the basis of the reduced short-circuit stresses occurring on the load side of the short-circuit protective device in this unit provided that these conductors are arranged such that under normal operating conditions an internal short-circuit between phases and/or between phases and earth is only a remote possibility, for example by being provided with adequate insulation or shrouding.

Particular attention shall be paid to the provision of adequate facilities for making off the main power supply cables. Attention must be paid to the vermin proofing of single core cabling.

Bunched cable connections will not be accepted between busbars and outgoing power circuit breakers, fuses or isolators.

GS.1.5 EARTH BUSBAR

A solid copper earth bar shall be provided inside each assembly at the back and along the entire length, at a height of approximately 500mm above floor level, or 200mm above the gland plates. A bar is to be provided at the top of the assembly where top entries exist and this shall be solidly connected to the bottom earth bar.

The earth bar will be supported on robust spacers and will have a minimum clearance of 40mm to the sheet steel panel.

The earth bar shall have a cross-section of not less than 40mm x 6mm and shall be drilled with the requisite number of holes for the individual connection of all cable ECC and other earth conductors.

High tensile phosphor bronze or cadmium plated nuts, bolts and lock washers shall be provided through the earth bar at each earth position and at least 5 additional holes will be provided for future connections, each being fitted with nuts and bolts as above.

The earthing positions shall be evenly spaced along the length of the earth bar and the bar must be clearly identified as the earth.

GS.1.6 BUSBAR CONNECTIONS

All connections and extensions to busbars shall be effected by means of high tensile phosphor bronze nuts, bolts and washers or cadmium plated, high tensile steel bolts and nuts which shall also be provided for future extensions. The minimum diameter of any holes will be 10mm.

In exceptional cases a relaxation of SANS 1973 may be permitted to allow the drilling of holes, in which case the cross-sectional area as measured is to be reduced by the area of the holes.

GS.1.7 EQUIPMENT

Unless otherwise stated on the drawings or as specified, the latest version of the following minimum specifications shall be assumed for equipment to be installed in the switchboards.

Busbars SANS 1195

Circuit breakers SANS 60947 Part 2 and SANS 156 Switches, disconnectors and fuse

Combination units SANS 60947 Part 3

Contactors and motor starters SANS 60947 Part 4 Page | 4

Control circuit devices and switching

Elements SANS 60947 Part 5

Multi-function switching devices SANS 60947 Part 6 Ancillary Equipment SANS 60947 Part 7 HRC fuses and fuse switches SANS 60269

SANS 60947 relates specifically to equipment for use at voltages up to 500 Volts

Where a voltage in excess of 500 Volts is specified, the manufacturer must confirm that the equipment is suitable and has been tested to that higher voltage.

The equipment to be mounted in the panels will be detailed in the drawings or as specified and schedules provided.

All contactors and/or starters shall be protected with suitable back-up HRC fuses or current limiting circuit breakers to protect the equipment against abnormally high currents or short circuits developing in the system.

The manufacturer will be required to ensure the correct co-ordination between fuses, contactors and overload relays to comply fully with SANS 60947 Part 4 in order to achieve "Type 2" co-ordination. Current limiting circuit breakers will only be permitted if the manufacturer submits full details of tests results confirming to Type 2 co-ordination.

Unless otherwise stated, contactors and/or starters shall be rated for 10 million operations for making and breaking no-load current to category AC3 as laid down in SANS 60947. Note that SANS 60947 requires equipment and wiring to be suitable for 7.2 x FLC for DOL starters.

Access to the various starters shall be possible without isolation of the entire MCC, but the doors corresponding to each compartment shall be inter-locked with a local isolator in order that any compartment must be isolated before access to the equipment can be obtained. A mechanical device shall be incorporated in each isolation in the off position to provide a locking out facility during maintenance periods.

Timers and relays controlling a starter shall be mounted in the compartment with the starter. All timers and relays must be clearly labelled with the identity given on the schematic diagrams.

GS.1.8 DERATING OF EQUIPMENT

Full cognizance must be taken of manufacturers derating tables of equipment located in enclosures and the rating of that equipment must be increased accordingly. In all such cases labels must be provided on the front of the associated cubicle stating the maximum permitted circuit loading.

Where high ambient temperature and/or continual high loadings are anticipated, the assembly must incorporate adequate ventilation systems to eliminate the possible build-up of excessive temperatures or humidity. Where specified, renewable filter elements must be incorporated.

GS.1.9 CABLE TERMINATIONS

Due to the continuing miniaturization of equipment, difficulties can be experienced in terminating power cables onto equipment terminals, particularly where more than one cable has to be terminated. The manufacturer shall ensure that suitably designed and rigidly braced copper stubs are extended from such terminals to facilitate the termination of all cables.

GS.1.10 INSTRUMENTATION

All instruments shall be of a matching flush pattern, preferably with a 96mm x 96mm square dial.

All main incoming panels shall be provided with three combined maximum demand/instantaneous ammeters, a voltmeter and selector switch as well as any additional instrumentation detailed on the single line diagrams or as specified. Page | 5

GS.1.11 AMMETERS

Combined maximum demand type instruments will comprise a moving iron ammeter showing the instantaneous current value, combined with an ambient corrected, manually reset, thermal maximum indicating ammeter which will indicate the mean current reached during any 15 minute period.

The starter cubicles for all motors rated at 2, 2kW and above and all motor driven pumps irrespective of size shall be provided with an ammeter, which shall incorporate an adjustable red pointer and an extended starting characteristic. Allowance must be made for the full load current of all motors to be checked and for all red point to be set accordingly.

GS.1.12 CURRENT TRANSFORMERS

Where applicable, the current transformers shall generally be of the ring type complying with the requirements of SANS 60044-1, as amended. The current transformers shall have a Class 3 or 5 accuracy.

GS.1.13 VOLTMETER

Voltmeters shall be of the moving iron, suppressed zero type, having a full scale deflection of not less than 480 Volts, unless otherwise specified.

GS.1.14 VOLTMETER SELECTOR SWITCH

All voltmeter selector switches shall be wired to connect the voltmeter between all phases and each phase and neutral and shall disconnect it in the OFF position. The switch shall have a position located switching mechanism.

GS.1.15 INSTRUMENTATION FUSES

All instrument fuses shall be mounted in the panel onto or next to the busbars. 6mm² wiring shall be used between the busbars and the fuses and shall be kept as short as possible.

HRC cartridge fuse links to SANS 60269 shall be used and shall incorporate visual indication devices to facilitate

the location of blown fuses on visual inspection. They shall be designed to clip into the fuse carrier contacts without the use of fixing screws.

Wiring from fuses bases to instruments may be bunched but must be suitably supported in Bowthorpe Hellerman trunking or lacing.

GS.1.16 PROTECTIVE DEVICES AND PROTECTION SETTING

The switchgear shall be provided with the specified protection and auxiliary relays, which must be of a modular pattern, readily accessible, replaceable and extensible.

The thermal overload releases and instantaneous magnetic short circuit trips are to be adjustable over the trip ranges as specified by the Employer's Representative.

The contractor must allow to grade, set and test the protection devices for the main switch, bus section switches and each motor circuit.

GS.1.17 PUSH BUTTONS AND INDICATING LIGHTS

Unless otherwise indicated, the following is the minimum requirement for illuminated push button and indicating lights:

START and STOP push buttons

RUN, STOP, THERMISTORS and HEATER lights

Indicator lamps may only be of the neon or LED types. Where LED's are used as indicators on main supply voltages, a suitable current limiting capacitor and reverse voltage protection diode must be Page | 6

used. For low AC or DC voltage ($\pm 24V$) a current limiting resistor will suffice.

GS.1.18 CONTROL VOLTAGE SUPPLY /BACK UP SUPPLY

The control voltage shall be provided by a single phase, double wound transformer supplied from the Red and White phases of the main busbars, with the secondary voltage as specified on the schematic diagrams or as specified.

The primary and secondary connections are to be provided by suitably rated and labelled HRC fuses.

Unless otherwise specified, the transformer shall be rated at $0.8 \times$ (total hold-on VA of all contractors plus VA of all lights and relays plus pull-in VA of largest device) with a further additional allowance of 50% for future extensions.

Should the main busbar system incorporate a bus-coupler, 2 control transformers shall be provided. Supplies to the 2 transformers shall be controlled by contactors interlocked to ensure that only one transformer supplies the control circuit at any one time.

Where suitable, a control voltage busbar shall be provided along the length of the MCC. A power supply unit with backup up battery for the PLC is to be installed and wired in a separate cubicle. The 12V DC circuit must be supplied by a 25W DC/DC converter for equipment using 12Volts (eg. room security sensors). Two (2) backup batteries are to be low maintenance sealed lead acid type of 12 V DC 70AH.

GS.1.19 CABLING, WIRING AND TERMINALS

GS.1.19.1 STARTER WIRING

Particular attention shall be paid to be the method of wiring from busbars to the individual compartments, in order to avoid any cable crossing through a compartment with which it is unrelated.

The wiring between all starter components, isolators, fuses, contactors, overload relays and terminals is to be rated to suit the maximum capacity of the starter and is to be not less than 6mm^2 .

Three phase panels shall be wired in red, yellow and blue PVC insulated conductors for the phases, black for neutral and green earthed circuits.

Single phase panels shall be wired in red and black PVC insulated conductors, for phase and neutral respectively and green for earthed circuits.

Neutral connections shall be black and this colour must not be used for any other wiring.

Multi-stranded or laminated conductors shall be used between all items of equipment in preference to solid conductors. The insulation of these conductors shall not be stripped beyond the leading edge of the terminal in which it has to be accommodated.

Stripping shall be carried out without damage to the conductors, preferably by means of a cable stripper.

Approved crimping lugs and ferrules or approved clamps shall be used for connection into equipment not provided with compression type terminals.

All panel wiring shall be completed and installed at the MCC manufacturing works. The wiring shall be loomed or encased in PVC cable trunking of Hellerman manufacture or equal approved and shall be carried out neatly along vertical and horizontal lines.

GS.1.19.2 CONTROL AND INSTRUMENTATION

Suitably protected control supervisory and auxiliary circuits must be wired with 1 mm^2 conductors. The wire colour codes must be according to SANS 10142-1:2012. Edition 1.8 Page | 7

Neutral - Black

+24 Vdc - Grey (Marked +24Vdc)

-24 Vdc - Blue

12 Vdc - Yellow (Marked +12Vdc) -12 Vdc - Blue

Telemetry - Purple

Each end of the conductor shall be terminated in a pre-insulated, spade or pin type lug, applied by means of the recommended colour coded crimping tool. All control wiring shall be clearly marked by interlocking plastic ferrules, the numbers corresponding to wire numbers on the schematic diagrams.

If control and/or supervisory wiring is required for equipment which is installed on the doors of the panel the wiring shall be bunched together and suitably strapped with spiral binding in the form of a vertical "U" loop between the door and the panel, to ensure that there is no tension on the wiring when the door is rotated along its vertical axis. Approved wiring supports shall be fixed onto the hinged panels, to relieve the weight of the cables off the equipment terminals. Each door shall be suitably earthed.

GS.1.19.3 POWER CABLE TERMINATIONS

Sufficient space must be allowed for the connection of all known and future incoming and outgoing cables.

Outgoing cables shall be glanded off on galvanized gland plates at the bottom or top of the vertical cables ways.

Where top access is required, it will be specified in the tender document.

Approved shrouded and shielded terminals shall be provided for the outgoing connections to each motor for conductors up to and including 35mm², rated at least 50% in excess of the conductor rating. The terminals shall be fixed in the vertical cables way of the assembly and shall have ample space for making off the outgoing cable terminations.

Conductors of 50mm² and above shall be terminated directly onto the starter equipment, but the cables must be adequately supported to ensure that no strain is imposed on the equipment.

GS.1.20 GLAND PLATES

A strong and robust 3mm hot dipped galvanized cable gland shall be provided along the entire length of the assembly at a minimum height of 300mm above floor level. The gland plate shall be constructed in sections and bolted in position to take the load of the cables being glanded to it.

When cables enter/exit from the top of the board, the top cover plate will act as the cable gland plate and shall also be 3mm thick. It shall be bolted to the frame so that it can be removed if necessary. The terminals associated with these cables will be mounted not less than 200mm below the top cover plate.

All gland plates shall be machine punched in the factory to suit each and every cable gland required. Under no circumstances will any drilling or filing be allowed on site.

GS.1.21 OUTGOING POWER CIRCUITS

All cables shall be terminated with approved glands to suit the application. Particular attention shall be paid to the termination of ECC cabling to ensure the continuity of all earth conductors.

Every termination of a power cable shall be provided with an approved numbered Bowthorpe Hellerman tag identifying its size and destination, fixed below the cable gland plate in a position which is easily observed from the front to the boards. This procedure must also be incorporated at the motor termination box. Page | 8

GS1.22 MARSHALLING COMPARTMENTS

When specified, marshalling compartments shall be provided for control circuit wiring.

The marshalling compartment shall be adequately sized to accommodate all the required terminals PLUS provision for a further 50% spare terminals.

Where a motor control centre is to be broken down for transportation to site, each section shall be provided with a marshalling compartment to the above requirement so that the associated wiring is not disturbed.

Where such control circuits are unavoidable and control wiring has to cross a break, it shall be suitably identified and disconnected at one end during transportation.

Terminals for each starter should be grouped together and clearly identified by a permanently affixed label. Terminals shall be mounted on rails and space shall be provided for spare terminals after each group of terminals.

A suitable gland shall be provided for terminating the control cables and adequately sized cable way shall be provided for running the cable ends to the terminals in the marshalling compartment.

A 220 Volt switched socket outlet shall be provided in each marshalling cubicle. Where specified, a switched light shall also be provided.

GS.1.23 SURGE DIVERTERS AND 4-20 MA LOOPS

Where specified the MCC is to be equipped with surge diverters of approved manufacture and bearing the SANS mark.

The arrestors or diverters shall be mounted inside the panel on the incoming unit. The supply side connections shall be made in the factory to the three phase busbars, whilst the earth side connections shall be made to the earth bar of the board.

All 4-20 mA loops are to be electrically isolated from the PLC analogue input by means of an isolator unit or splitter unit.

All loops entering the panel from the field must be protected by means of surge protection units. With circuit breaker protection, equal or approved. All surge protection units are to be bonded to earth by means of 4mm² multi strand earth cable.

GS.1.24 SPARE FUSE CARTRIDGES

Where HRC or other cartridge types fuses are specified or used to protect instruments or circuits, the MCC shall be suitably equipped with a compartment for housing one third of all fuse cartridges specified, having a minimum of 1 set (i.e. 3 phase) of fuses of each size specified and all such spare fuses shall be provided inside this compartment on handing over. The compartment shall be clearly labelled: "Spare fuse cartridge": replace used-up fuses.

GS.1.25 LABELS

The requirements of SANS 10142-1 must be complied with.

All boards or panels shall be fully labelled using sandwich type labels, fixed to the board or panel by means of either screws or rivets, or by gluing into metal label holders which are bolted to the board.

Labels should be black lettering on a white background, not less than 6mm in height and mounted centrally below each respective starter unit, in an approved position. A centrally mounted label shall be provided to indicate the manufacturer's details, the design busbar rating and asymmetrical fault level. Page | 9

A label indicating where the board is "Fed From" shall also be fixed to each MCC.

All relays and wiring terminal blocks inside the MCC shall be labelled to clearly identify the control gear and wiring to equipment.

The cable markings shall indicate the number of cores – core cross sectional area – original of the cable – cable number, of the cable. E.g.

4-35-M-01 2-2.5-M-02

Pump 1 cables

3-10-P1-01 7-1-P1-02

Pump 2 cables

3-10-P2-01 7-1-P2-02

Pump 3 cables

3-10-P3-01 7-1-P3-02

GS.1.26 WORK TESTS

The MCC shall be fully assembled and wired before being dispatched from the works. The Contractor and the switchboard manufacturer will carry out a full functional test to prove the correct operation of the entire MCC, including interlocking, remote control and the simulation of all protection devices. All other circuits external to the switchboard will be simulated and will be tested accordingly.

All MCC's with a fault level of 10kA or more shall be type tested by an accredited person and a signed certificate issued with the MC., The costs of all these tests shall be borne by the contractor. The tests shall be witnessed by the Employer's Representative.

Unless otherwise specified, the correct function of the PLC hardware will not be the responsibility of the MCC manufacturer, but the contractor will be expected to have an artisan standing by during tests in order to observe the MCC operations and carry out any remedial work required.

The tests shall be witnessed by the Employer's Representative and shall be recorded in triplicate on approved test forms.

GS 1.27 SOFT STARTER

Conformity of standards

EC

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

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: Page | 10

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°C with de-rating of maximum 0.8% per °C above 40°C
- 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:
 - o Stand still brake, to keep the load still before start
 - o Motor heating, to keep the motor well-tempered before start
 - The soft starter shall have the following start ramps available:
 - o Voltage start ramp
 - o Torque start ramp
 - o 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:
 - o Current Limit
 - o Dual Current Limit
 - o 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

GS1.28 VARIABLE SPEED DRIVES

1. General

This part of the specification describes the general requirements for the Variable Speed Drives, the VSDs. The nominal values, the standard documents and the drive's minimum performance are defined in this part. The VSD does not include motor in this specification. The specification uses the term Motor unit which means a combination of the VSD and the motor.

If the project-specific part of the specification (Appendix A) is in contradiction with the other parts of the document, the project-specific document shall apply.

2. Requirements for the Manufacturer

2.1 Certifications

The Frequency Converter Manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system.

The Manufacturer shall have the Environment Certification ISO 14001.

2.2 Experience

The Manufacturer shall have adequate experience in frequency converter manufacturing and have adequate business volume in order to provide credibility in his commitments and a capability of long term support. The Manufacturer shall prove his experience by quoting references of units in the specified power and voltage range.

2.3 Local support

The Supplier shall have a permanent representative office with a trained and skilled support staff, in the country where the goods are delivered, in order to prove his commitment for local support and to provide a channel for communication. The local representatives shall be easily accessible and shall

be able to arrive at the site within 24 to 48 hours' notice.

The Engineers employed by the Supplier's regional office shall be certified by the Manufacturer and provide start-up service including physical inspection of the drive, connected wiring and final adjustments, to ensure that the VSD meets the required performance.

The Supplier shall be able to give basic drives training to the Customer's engineers, preferably on the site but anyway, in the country where the customer's site is. The training shall, as a minimum, include system concepts and basic troubleshooting. The Supplier shall also be capable of solving most VSD problems quickly. He shall also have a 24-hour support from the Drives Factory, to avoid any delays during service or repair work on the site.

The Manufacturer shall be able to offer commissioning of the drive to be done by the local office.

The most common spare parts like fuses, IGBTs as well as main control- and IO-boards shall be available in 48 hours from the notification through a regional service center of the Supplier. The more rarely used spare parts should be available in maximum 5 days on site!

3. Basic requirements for the VSDs

3.1 General requirements

The VSD shall be of the most modern design, yet user friendly and be simple to install, commission and maintain. The VSD shall be able to start and control the speed of a standard squirrel cage induction AC motor. The VSDs shall be CE marked. The VSDs have to be built to comply with the IEC standards. In the Australian market the VSDs shall have a C-tick.

The materials used in the VSD shall be recyclable, non-toxic and flame retardant.

The VSD shall be a digitally controlled drive, using, at least, the Pulse Width Modulation (PWM) with flux vector control, a Direct Torque Control (DTC), or equivalent. It shall have IGBT's in the inverter section of the throughout the power range, and it shall have the following minimum specifications.

Operating conditions:

Rated Input Voltage : 380V - 415V, three-phase, + 10% or : 380V – 500V, three-phase, + 10% or : 525V – 690V, three-phase, - 10%, + 5%

Rated Input Frequency : 48 - 63Hz

Fundamental Power Factor : 0.97 or better at nominal load Efficiency : ☐ 98 % at nominal load

Output Voltage : 0 - UN, three-phase

Output Frequency Range : 0 to 300 Hz, adjustable

Output Frequency Resolution : 0.01 Hz

Accel/Decelerate Time : 0 – 1800 s, adjustable Overloadability (by load type) :

Constant Torque : 150% of nominal current for 1min in every 5 mins. Variable Torque (pump & fan) : No overloadability required

Ambient Temperature : 40 °C, for higher temperatures see below

Installation Altitude : 1000 m, for higher altitudes see below

Max. Relative Humidity : 95%, non-condensing. In presence of corrosive gases, the max. relative humidity is 60 %

Max. Corrosion Level of the Cooling Air :

Chemical Gases : IEC 721-3-3, class 3C2

Solid Particles : IEC 721-3-3, class 3S2

Max. Vibration Level (IEC 68-2-6) :

2 to 9 Hz : 0.3 mm

9 to 200 Hz : 1 m/s²

Main Protections : Overcurrent, short circuit, input/output phase loss, motor overload and underload, over/under-voltage, Page | 13

overspeed, overtemperature, motor stall, other internal fault.

The VSD shall be able to give a 100 % output current continuously in the above specified conditions. In order to ensure that the drive can provide the required output current in the specified ambient conditions, the Manufacturer shall inform the required derating, if the ambient temperature given in the project-specific specification is higher than 40 °C or if the installation altitude is more than 1000 m above the sea level. The derating factor shall be specified so that neither the lifetime of the VSD nor the unit's performance, overloadability included, nor the reliability of the VSD shall suffer.

Storage conditions (in the protective package):

Ambient Temperature : - 40 to +70°C

Corrosion Level of the Cooling Air :

Chemical Gases : IEC 721-3-3, class 1C2

Solid Particles : IEC 721-3-3, class 1S3

Max. Vibration Level (IEC 68-2-6) :

2 to 9 Hz : 1.5 mm

9 to 200 Hz : 5 m/s²

Shock (IEC 68-2-29) : max. 100 m/s², 11 ms

Free fall : 250 mm for weight under 100 kg 100 mm for weight over 100 kg

3.2 VSD Accuracy

The VSD shall have a minimum speed control accuracy of ☐ 10% of the nominal slip of the motor, without a pulse encoder feedback. In practice, this means e.g. for a four-pole, 50 Hz motor with a 45 rpm slip speed, an accuracy of ☐ 0.3 % of the motor nominal speed. The VSD shall be capable of a dynamic accuracy of at least 0.4 %sec. without additional options. If this accuracy is not achieved without a speed feedback, the Manufacturer shall specify the accuracy that can be reached and if required, a pulse encoder with adequate control devices shall be included in the motor unit at the VSD Supplier's expense. The dynamic accuracy means the drive's capability to response fast in a dynamic situation, for example, if the load changes. It is measured by the change of speed and time, i.e. how long it takes to recover to the reference speed.

3.3 Starting torque and torque step rise time

Constant torque applications: The Starting Torque of the Motor unit without a pulse encoder feedback shall be at least 150 % of the rated Motor unit torque.

Variable torque applications: The Starting Torque of the Motor unit without a pulse encoder feedback shall be at least 100 % of the rated Motor unit torque

In case of need of fast torque rise time, the torque step rise time from 10 % to 90 % of the full nominal torque should be less than 5 m/s, when the motor is fully magnetized. If the motor mechanical time constants are longer than that, the torque step rise time should be according to mechanical time constant.

3.4 Quality assurance and warranty

Every VSD has to be tested functionally. The inverter part of the VSD or each inverter module at least has to be tested by running it with a motor at full nominal load. A test report of the tests made has to be included with the VSD.

The warranty period of the VSD has to be a minimum of 24 months from the date of delivery or 12 months from

the date of commissioning, whichever comes first.

4. Enclosure and mounting

The VSDs up to 75 kW in 400 V and 690 V or 90 kW in 500 V, can be installed separately in drive modules. There should be a possibility for flange mounting, to provide for cases, when the drive is installed in a cabinet and to enable installation of the heatsink outside the cabinet. Page | 14

The VSD shall be equipped with fuses and a main circuit switch must be available either as standard or, at least, as an option. The switch shall be equipped with a door interlocked handle, pad-lockable in the open position. Input fuses shall be of semiconductor type, and their characteristics coordinated with the drive's electronic protection circuits so that they do not blow from normal output faults such as an overcurrent fault. The Control Panel of the VSD shall be accessible for programming and controls with the main door closed. The whole assembly shall be implemented with a strict consideration of the EMC Compatibility and Regulations as described further in this specification.

Panel Design Specs:

Standards : IEC 439-1, EN 60439 & VDE660 Part 500.

Protection Class : IP21 or better

Cabinet access : From front

Cable entry and exit : Bottom entry as standard. Both bottom and top entry have to be possible.

5. User interface

5.1 General

The user interface shall be similar throughout the power range to avoid confusion amongst the user's and need for training in several different units.

5.2 Inputs and outputs

The following standard Inputs and Outputs at least shall be provided, to be used in interface with the control system:

Analog Inputs : 1 x Programmable differential voltage input 0(2) - 10V

2 x Programmable differential current input 0(4) - 20mA Analog Outputs : 2 x Programmable current outputs 0(4) - 20mA

Digital Inputs : 6 x Programmable Digital Inputs, opto-isolated, common or separate ground

Relay Outputs : 3 x Programmable Digital outputs with a changeover dry contact

All the control terminals shall be clearly marked.

The following functions at least shall be available via the IOs:

Input Output

Analogue Analogue

Speed reference Motor speed

Torque reference Motor torque

PID-control feedback (actual value) Motor current

Correction signal to reference Output frequency Output voltage Output of the process PID controller

Control deviation of the PID controller Actual value of the PID controller

Process speed

Digital Relay

Start Fault

Stop Running Forward/reverse Ready Pre-programmed constant speeds Rotation direction Speed up / down (motor potentiometer) Fault/warning Page | 15

Start and stop from 2nd source Warning

Selection of acceleration / deceleration ramp Stall fault or warning

Selection of user macro VSD temperature fault or warning Run enable Motor temperature fault or warning Se-

lection of control place Speed or torque limit reached Fault reset Motor magnetized

Controlled via serial communications

5.3 Serial communications

The VSD shall as standard have a provision for communication with PC software tools. In addition, the following serial communication protocols at least shall be available as option: Modbus, Modbus+, Interbus-S, Profibus DP, LONWORKS and DeviceNet. It shall be possible to add the serial communication later.

5.4 VSD keypad

The VSD shall have a detachable keypad with alphanumeric operating display for programming and controlling purposes. The displayed messages shall be in user friendly, descriptive text. Coded messages are not

acceptable. Parameter setting shall be possible by using the keypad.

Parameter setting shall be easily accessible and user friendly with actual text messages. Password protection shall be provided to avoid unauthorized tampering with the set parameters. It shall be possible to read and write the set parameters with the help of the control pad, enabling thus copying of parameters between the VSDs of a similar application, to save time during the commissioning and to avoid mistakes. The VSD shall have a local lockout to prevent accidental transfer from remote to local.

Direct keypad entry shall be provided to observe the following actual parameters. Any three of the following parameters or actual values shall be selected to be always displayed.

- Input Voltage
- Input Frequency
- Output Voltage
- Output Frequency - DC Bus Voltage
- Output Power
- Output Torque
- Output Current
- Motor Speed
- Process Speed

The following parameters shall always be displayed during normal operation.

- Speed Reference - Run / Stop / Fault - Remote / Local

The VSD shall have self-diagnostic properties to display faults and warnings as they occur and be able to store at least 15 previous faults into the fault memory. The fault memory shall be accessible by PC maintenance tools.

The following drive control functions at least shall be available from the keypad:

- Run - Stop - Local / Remote selection.
- Forward/Reverse (if function enabled) - Accelerate (manual/mode)
- Decelerate (manual/mode)
- Parameter setting Page | 16

- Scrolling & Viewing through Actual values

5.5 Application programming

The VSD shall be designed for both simple and the most complicated applications, yet it shall be user friendly. The VSD shall have built-in application macros, to allow selection of the range of pre-programmed control configurations and further, the VSD shall enable storing of two customer modified macros at least, to suit the specific application. It shall be possible to reset the parameter settings back to the original macro settings through the keypad. The parameter readouts shall be in text format and not coded.

5.6 PC Tools

The VSD Supplier shall have a Windows based PC software available for monitoring and controlling the VSDs, and the software shall be offered as an option. The software shall be supplied with the necessary hardware and a provision for connecting a PC with the VSD. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software.

6. Software features

6.1 Power loss ride-through

The drive shall have a power loss ride-through capability. This means that the drive controls should stay alive during a power loss by means of the energy stored in the load. The ride through time shall be the longer the higher the kinetic energy of the load is. The motor shall be magnetized as long as there is kinetic energy in the system.

6.2 Flying start

The drive shall have a built-in Flying Start feature. This feature will allow a Motor unit which is still rotating, to be restarted without first stopping it. The VSD shall restart the motor from the rotating speed and then reaccelerate to the speed indicated by the speed reference signal. The Flying Start feature shall be available in both directions, to be able to start the drive in the required direction regardless of the rotation direction of the motor.

6.3 Flux Optimisation

The VSD shall have a built-in automatic Flux Optimization function. The Flux Optimization function minimizes the sum of the magnetizing current and the load current so that the drive can still follow the given reference. This feature reduces energy consumption and motor noise when driving at less than the nominal load.

6.4 Flux braking

There shall be a possibility for Flux Braking, where VSD increases the motor magnetization to dissipate the extra energy in case of need for small braking power. It shall be possible to use the braking to decelerate the motor from one speed to another – not only for stopping the motor.

6.5 Critical speed jump-over

The VSD shall have programmable skip speeds to jump over critical resonance speeds. If the speed reference is in the critical speed area, it is ignored and the latest speed reference is maintained. Three programmable critical speeds at least shall be available. Page | 17

6.6 Current/speed limiting

In case the acceleration or deceleration ramps are too fast for the drive capacity, the drive shall be able to automatically reduce the ramp to prevent tripping. Also, in case of transient overloads the drive shall automatically reduce speed to prevent an overcurrent trip, if the drive capacity is not sufficient to handle the load.

6.7 PID-controller

The drive shall have a built-in PID-controller for control of the customer process.

6.8 Restart

In the event of a fault trip due to overvoltage, overcurrent or loss of analogue signal, the VSD shall be programmable to attempt an automatic restart. For safety reasons, the maximum number of attempts shall be five (selectable) within a short time. If the fault does not clear after the attempts, the drive shall lock out.

7. Environmental effects

7.1 Harmonic Distortion

The VSD shall have built-in AC or DC chokes to minimize the Total Harmonic Distortion (THD). The THD of the unit for current has to be less than 50% in a supply network with a short circuit ratio (SCR) of 300 (i.e. the ratio of the supply network's short circuit current to the unit's nominal current). If the supply voltage is 440 V or higher, the THD value has to be less than 55%. However, the VSD Manufacturer shall submit to the contractor the VSD Harmonic spectrum for the project-specific supply network. The spectrum shall be used in the design of appropriate harmonic filters, if required by the Customer. The single harmonics shall be presented up to 25th harmonic and the THD has to be calculated taking into consideration harmonics up to 40th harmonic.

7.2 EMC Regulations and Compatibility / C-Tick

The supplied VSDs shall carry the CE mark (or C-Tick in Australia) indicating that they comply with the essential requirements of the relevant EU directives (or C-Tick requirements in Australia). The VSDs shall meet the requirements set in EN 61800-3 for Industrial Low-Voltage Networks. If the project-specific specification states that the requirements for Public Low-Voltage Networks stated in EN 61800-3 must be met, the Supplier shall be able to provide such units at least up to 75kW in earthed networks. If separate EMC filters are required, they shall be of built-in type.

A detailed description and other directions to maintain the EMC Compatibility during the installation of the VSD and associated field cables and connections, shall be given by the Supplier in conformance with the EMC Directives or C-Tick. The Contractor shall follow the directions during installation, in order to achieve attenuation of the RFI.

7.3 Audible Noise

The full load audible noise of the frequency converter shall not exceed 70 dB(A) in 200kW applications and below. Above 200 kW, the full load audible noise shall not exceed 78 dB(A). If the frequency converter is installed in a cabinet and requires a separate cooling fan, these limits also include the noise of the additional cooling fan. This requirement is made to keep the electrical room quiet so that it is not necessary to use hearing protection. The audible noise of the motor should also be minimized. For that purpose the switching frequency of the frequency converter shall be at least 2 kHz throughout the power range.

7.4 Efficiency

The full load efficiency of the VSD shall be at least 98 % including all the additional equipment which is needed to meet this specification. Page | 18

GS.1.29 SITE TESTS

After completion of erection, cabling and field wiring, the contractor shall set all overloads, protection devices etc. and shall again carry out a full functional test to prove the correct operation of the entire MCC, including the simulation of all remote devices. A signed compliance certificate by the Contractor's accredited person for the MCC and its installation shall be handed over to the Employer's Representative on Completion.

The tests shall be witnessed by the Employer's Representative and shall be recorded in triplicate on approved test forms.

GS.1.30 INSTALLATION OF MOTOR CONTROL CENTRES

The contractor shall make it his responsibility to furnish the switchboard manufacturer with all the relevant information in respect of the accommodation to be provided, including cable trenches and ducts etc.

Where possible, the largest number of cubicles or panels should be installed intact, to avoid assembly on site, provided space and handling facilities and conditions do not lead to damage of the unit.

The contractor will advise the manufacturer which of the cables enter or leave from the top or bottom of the MCC.

GS.1.31 DRAWINGS, EMPLOYER'S REPRESENTATIVE'S APPROVAL, GUARANTEES

CAD generated drawings of the equipment showing full details of layout and proposed wiring system and equipment offered shall be submitted for approval to the Employer or his Representative prior to manufacture. The drawing must include part numbers and manufacturer's of all plant and equipment.

The Employer's Representative shall also be advised when the board are being manufactured and when they will be ready for inspection at the works, Equipment which is des-patched to the site without the authorization of the Employer or his Representative may be rejected and all costs incurred in having it returned to the factory, where necessary, and any liability for delays, will be for the contractor's account.

The contractor will issue to the Employer's Representative one set of sepia's and 3 copies of drawings of the "As Built" equipment which has been installed and connected on site after the draft copy has been approved. Handbooks, spares lists and maintenance instructions etc. will be issued to the Employer's Representative in triplicate at the time of handing over the equipment before the guarantees period commences.

The manuals shall be comprehensive and to include all equipment supplied. A 12 month guarantee shall cover the sheet metal enclosures and all the equipment installed therein against fault workmanship and materials. The guarantee period shall begin from the date the MCC's are completely installed and accepted by the Employer's Representative. Fair wear and tear of equipment will be excluded from the guarantee.

GS.1.32 COMPLETION

Prior to the handing over of the boards or panels and the associated electrical installation, they shall be rendered completely free of all dust or rubbish that may have collected during installation and building operations, and finished surfaces shall be made good where necessary, using the identical paint finishes from the same batch, as at the time of manufacture.

The MCC's shall be vermin proofed. Similarly, all cable trenches will be thoroughly cleaned out and all covers fitted before the work will be considered as complete. All labels will be correctly engraved and fixed to panels and cables as specified before the work can be considered complete. Page | 19

All cable sleeve or other openings shall be closed or patched up and made good: Cable sleeves shall be sealed using an approved expanding foam sealer and neatly trimmed.

GS.1.33 SUGGESTED SUPPLIERS

Refer to the PROJECT SPECIFICATION

GS.1.34 MANUFACTURERS

Manufacturers may be considered by the Employer's Representative, but only if they have a proven track record of manufacture to SANS 1473/SANS 60439.

The tenderer shall ensure that copies of these Standard Specifications, Detailed Specifications, layout drawings and single line diagrams if available shall be provided to the manufacturer's to ensure that they make full allowance for all requirements in their pricing.

GS.1.35 PLC SPECIFICATION

GS.1.35.1 PLC HARDWARE

All PLC hardware that would be required to meet the I/O and philosophy requirements. Architecture and Bill of Materials provided as reference. When specified in the tender document, provision shall be made for mounting the PLC hardware in the motor control centre. All PLC components will be supplied by the contractor. Details of the equipment to be installed and the required arrangement of such equipment will be included in the tender document. In general, the manufacturer shall allow 1 or more compartments or tiers in the MCC for rack assemblies which shall accommodate ONLY the PLC hardware, including the input and output modules. Where special power supplies such as a CVT, UPS or DC supplies are specified, these shall be regarded as part of the hardware and shall be mounted in the same compartment as the other equipment. The power circuit drawings and the control schematics relating to each MCC will include all connections to the PLC hardware. All such connections shall be made by the MCC manufacturer via the marshalling compartment. In addition to the general power earth bar specified elsewhere, an "Instrument Earth 0 Volt Bar" and an "Instrument Screen Earth Bar" shall be provided in each compartment housing PLC Hardware and these shall be used only for instrumentation earthing connections. They shall be electrically isolated from the power earth. Particular attention shall be paid to the provision of cabling facilities to the modules. Adequate PVC cable trunking shall be installed and separate trunking shall be provided for analogue and digital circuits. Wiring to and from analogue input and output modules shall be carried out using cables equal to Contronics DEKORON control cable Type 1751, with 0.5mm² conductors. Each analogue control cable shall be individually earthed to the instrument earth bar by means of its tinned copper drain wire AT ONE END ONLY. The wiring between each starter panel and the digital input and output modules in the PLC panel shall be as indicated on the circuit diagrams and shall be installed in adequately sized PVC trunking with provision for 50% spare capacity. With the exception of the PLC output to the starter or relay coil, no power circuits may be run in this PVC trunking. Each end of each core shall be terminated in a spade or pin type pre-insulated lug and marked with its respective wire number by means of interlocking plastic ferrules as detailed in the circuit diagram or termination schedule. Where connections are to be made between the PLC I/O modules and field cabling, the MCC manufacturer shall wire the I/O module terminal to the

marshalling compartment.

The PLC shall be coded using IEC-61131-3 standards.(Ladder Logic) or other approved standard.

GS.1.35.2 STRUCTURE

All Tags should follow a detailed I/O list and conform to a standard structure in naming conventions. All Networks are to be commented and defined. Tag naming conventions to be defined and documented. Page | 20

GS.1.35.3 KNOWLEDGE TRANSFER

The PLC programmer should ensure Knowledge transfer in terms of PLC Programming. This should be done at the PLC programmers office and the Program should be clearly defined in terms of structure and method.

GS.1.35.3 CERTIFICATIONS

Must be a Recognized Certified DELTA or Allen Bradley System or as approved by the Client and Engineer.

GS.1.35.4 TRAINING

Training - The contractor should provision for Training for the Client's operations and maintenance staff members as per provisions as specified in the BOQ.

GS.1.35.5 LICENCES

Licenses - The contractor should make provision for 2 of Mini Licenses or Licenses to suit his software and program or equivalent.

GS.1.35.6 TYPE

PLC Type – Delta or CompactLogix or similar and equal approved. Delta preferred.

GS.1.35.7 CONFIGURATION

Software Blocks: A modular software design shall be adopted. Standard software blocks shall be used for common control equipment such as motors, valves, actuators, measured values, alarms, totalizers, sequence and closed loop controllers.

GS.1.35.7 INTEGRATION

The PLC will need to integrate with the RTU by means of the Modbus RTU protocol over RS 485. The PLC shall act as the Modbus Slave. Where there are VSD's or Soft starters, then the PLC would integrate by means of Ethernet IP. Where there are Universal Motor Controllers, the PLC would integrate by means of Ethernet IP.

GS.1.35.8 CONTRACTUAL

Existing Code and Documentation- In certain instances the Client or Water Services Authority may provide existing code/s and QC documentation for re-use, therefore all aspects relating to the PLC coding and quality control should be priced but noted as an option, as only partial services may be utilized. A provisional sum should also be included to cater for instances where the PLC System Integrator/Engineer's services are required for technical assistance and/or for commissioning purposes.

GS.1.35.9 PLC QUALITY CONTROL

The Contractor shall prepare and submit (Hard and Soft copy) for approval, a Functional Design Specification explaining how the PLC software will be implemented and how the required control philosophy will be programmed. The Functional Design Specification shall include the following as a minimum: (A sample shall be provided by the contractor)

1. Software structural breakdown and description
2. Equipment modes of operation description

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1. Tag numbering system (equipment and software)
2. Complete device list (sensors, actuators etc.)
3. Complete input and output list with physical addresses
4. Logic diagrams for control of all devices
5. Complete list of all alarms generated within the PLC
6. Equipment start-up and shutdown sequences (including flow charts)
7. List of registers and timers with default settings
8. Complete data communications structure with tags (for HMI and/or SCADA systems)

The FDS shall be approved by the Engineer prior to bulk software configuration.

GS.1.35.10 INSPECTIONS

The minimum inspection of the PLC, by the Engineer, shall include the following:

- Correct choice of PLC CPU and power supply (calculations to be submitted)
- Correct configuration of all Input and Output Cards (drawings to be presented)
- Correct wiring of all expansion/ remote modules (drawings)
- Correct wiring of all input and outputs to marshalling strips (drawings)
- Code review of all PLC Control Logic (logic diagrams, flowcharts and software printouts to be presented)

- Review of the Contractor's Quality Control Documentation (check-lists to be presented)

GS.1.35.11 TESTING

The minimum testing of the PLC system, by the Client and Engineer, shall include the following:

1. Thin slice testing and acceptance of all software control blocks
2. Correct operation of all control logic
3. Correct operation of all modes of operation
4. Correct detection and annunciation of simulated faults
5. Correct inter PLC/ RTU data communication
6. PLC cycle time measurement

The compulsory method of testing shall be using the actual PLC that will be delivered to site and be simulated within the same MCC.

The Contractor shall carry out a full functional test to prove the correct operation of the PLC Program, including interlocking, remote control and the simulation of all protection devices. All other circuits external to the PLC shall be simulated and shall be tested accordingly. No PLC code manipulation shall be utilized to achieve the simulations.

The proposed testing procedure shall be documented by the Contractor and approved by the Client and Engineer before testing takes place. The tests shall be witnessed by the Employer's Representative and shall be recorded in triplicate on an approved test form before shipment to site.

GS.1.35.12 DOCUMENTATION

The following documentation shall be provided by the Contractor at the various project phases listed below: (Hard and Soft copy)

- DURING CONSTRUCTION

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- Control system architecture drawing
- PLC I/O list
- PLC loading calculations
- PLC panel General Arrangement drawing
- PLC panel schematic/wiring drawings
- PLC Functional Design Specification (FDS)
- Point to point wiring check certificates
- PLC panel IP certificate
- PLC panel Quality Control Documentation certificates
- PLC panel Certificate of Compliance and test report

- AS BUILTS

- Control system architecture drawing
- PLC I/O list
- PLC loading calculations
- PLC panel General Arrangement drawing
- PLC panel schematic/wiring drawings
- PLC I/O loop drawings
- PLC Functional Design Specification (FDS)
- PLC Trip and Alarm Matrix
- PLC Control Logic (logic diagrams, flowcharts and software)

GS.1.35.13 HMI QUALITY CONTROL

The HMI shall be inspected by the Engineer and tested by the Contractor (which tests shall be witnessed by the Engineer) prior to delivery, installation and switch-on at site.

GS.1.35.14 INSPECTIONS

The minimum inspection of the HMI, by the Engineer and Contractor, shall include the following:

1. Correct choice of HMI and power supply
2. Correct configuration of all HMI graphics, alarms and trend pages (drawings to be presented)
3. Correct wiring (drawings)
4. Review of the Contractor's Quality Control Documentation (check-lists to be presented).

GS.1.35.15 TESTS

The minimum testing of the HMI system, by the Engineer and Contractor, shall include the following:

1. Correct operation of equipment
2. Correct operation of all modes of operation
3. Correct graphics, alarm and trend operation
4. Correct inter PLC/ SCADA data communication
5. PLC cycle time measurement with HMI connected
6. PLC/ SCADA data communications response time measurement
7. Correct trends setup
8. Correct alarms setup
9. Correct user access level setup

GS.1.35.16 DOCUMENTATION Page | 23

This following documentation shall be provided by the Contractor at the various project phases listed below:

- DURING CONSTRUCTION
- Control system architecture drawing

HMI panel General Arrangement drawing

HMI panel schematic/wiring drawings

Functional Design Specification (FDS)

Point to Point wiring check certificates

HMI panel IP certificate

HMI panel Quality Control Documentation certificates

HMI panel Certificate of Compliance and test report
- Control system architecture drawing
- HMI panel schematic/wiring drawings
- Functional Design Specification (FDS)
- Point to point wiring check certificates
- HMI panel IP certificate
- HMI panel Quality Control Documentation certificates
- HMI panel Certificate of Compliance and test report

PS.1.35.17 TYPICAL HARDWARE LIST

PLC Hardware

The below list of hardware is current a typical installation within the PLC cubicle of the MCC using Rockwell equipment only ; or similar and equal approved: For this project , Schneider equipment is to be used.

Item	Description	Tag Name	Supplier	Part Number	Quantities
		(Ref. to DWG)			

1	PLC Controller	L16ER	Rockwell	1769-L16ER-BB1B	1
2	Digital Input Module	IB8-1/2	Rockwell	1734-IB8	2
3	Base Unit (for	IB8-1/2	Rockwell	1734-TOP	2

	above)					
4	HMI Display Unit	HMI	Rockwell	2711P-T7C21D8S	1	
5	Ethernet Switch	ETH01	Rockwell	1783-US5T	1	
6	Modbus Serial Module	MB-485	Prosoft	ILX34-MB485	1	
7	Power Monitor	PM500	Rockwell	PM500-ETHERNET	1	
8	Wireless Router	WIFI	D-Link	N150	1	

PART B2 : PARTICULAR SPECIFICATIONS

In addition to the Standardized and Project Specifications the following Particular Specifications shall apply to this contract and are bound in hereafter.

PB: OHS 1993: HEALTH AND SAFETY SPECIFICATION

PC: ENVIRONMENTAL MANAGEMENT SPECIFICATION

PD: EPWP REQUIREMENTS

PSE: RAPID SAND FILTER SUSPENDED FILTER BED, FILTER NOZZLES, FILTER MEDIA & FILTER
REFURBISHMENT

PG: STERILISATION OF TANKS AND RESERVOIRS

PSD 1: BLOWERS

PSD 2: PUMPS

GS 1: STANDARD SPECIFICATION FOR DB's AND MOTOR CONTROL CENTRES

PB: OHSA 1993 HEALTH AND SAFETY SPECIFICATION**PB.1 SCOPE**

This specification covers the health and safety requirements to be met by the Contractor to ensure a continued safe and healthy environment for all workers, employees and subcontractors under his control and for all other persons entering the site of works.

This specification shall be read with the Occupational Health and Safety Act (Act No 85 and amendment Act No 181) 1993, and the corresponding Construction Regulations 2003, and all other safety codes and specifications referred to in the said Construction Regulations.

In terms of the OHSA Agreement in Section C1.2.4 of the Contract document, the status of the Contractor as mandatory to the Employer (client) is that of an employer in his own right, responsible to comply with all provisions of OHSA 1993 and the Construction Regulations 2003.

This safety specification and the Contractor's own Safety Plan as well as the Construction Regulations 2003, shall be displayed on site or made available for inspection by all workers, employees, inspectors and any other persons entering the site of works.

The following are possible risks associated with this project:

- Working high above the ground on top and below the bridge, most of the time in a restricted environment with limited landings (working platforms);
- Working above a continuously flowing river and in a flood plain environment subject to flooding;
- Lifting and lowering of materials and equipment from the ground to the bridge and vice versa, exposed to cross winds;
- Steep and restricted access to the lower flood plain below the bridge
- Potentially dangerous existing services, i.e. gas lines, water and sewerage mains, electrical high voltage cables, on the bridge, buried and overhead
- Deep excavations in soils requiring shoring or reducing of slopes
- Blasting of hard rock or demolition of concrete
- High pressure during testing of the new rising main, which could result in potentially dangerous situations in the event of the pipeline or fittings failing
- Potentially harmful gasses when tying into existing sewer mains
- Movement of construction vehicles on site, taking into consideration steep slopes, other traffic and existing services
- Exposure to possible injuries due to mishandling or failure of power and hand tools
- Falling debris, tools and materials from bridge
- Non-conformance to specifications with regards to fasteners and materials
- Risks related to general safety and security on site
- Covid 19 and any other epidemic/pandemic declared.

Additional risks may arise from specific methods of construction selected by the Contractor which are not necessary covered in the above.

PB.2 DEFINITIONS

For the purpose of this contract the following shall apply:

Employer where used in the contract documents and in this specification, means the **Employer** as defined in the General Conditions of Contract and it shall have the exact same meaning as **client** as defined in the Construction Regulations 2003. **Employer** and **client** is therefore interchangeable and shall be read in the context of the relevant document.

Contractor wherever used in the contract documents and in this specification, shall have the

same meaning as "**Contractor**" as defined in the General Conditions of Contract.

In this specification the terms "**principal contractor**" and "**contractor**" are replaced with "**Contractor**" and "**subcontractor**" respectively.

For the purpose of this contract the **Contractor** will, in terms of OHSA 1993, be the mandatory, without derogating from his status as an **employer** in his own right.

"**Engineer**" where used in this specification, means the **Engineer** as defined in the General Conditions of Contract. In terms of the Construction Regulations the **Engineer** may act as agent on behalf of the **Employer** (the client as defined in the Construction Regulations).

PB.3

TENDERS

The Contractor shall submit the following with his tender:

- (a) a documented Health and Safety Plan as stipulated in Regulation 5 of the Construction Regulations. The Safety Plan must be based on the Construction Regulations 2003 and will be subject to approval by the Employer;
- (b) a declaration to the effect that he has the competence and necessary resources to carry out the work safely in compliance with the Construction Regulations 2003;
- (c) a declaration to the effect that he made provision in this tender for the cost of the health and safety measures envisaged in the Construction Regulations; and
- (d) Failure to submit the foregoing with his tender, will lead to the conclusion that the Contractor will not be able to carry out the work under the contract safely in accordance with the Construction Regulations.

PB.4

NOTIFICATION OF COMMENCEMENT OF CONSTRUCTION WORK

After award of the contract, but before commencement of construction work, the Contractor shall, in terms of Regulation 3, notify the Provincial Director of the Department of Labour in writing if the following work is involved:

- (a) the demolition of structures and dismantling of fixed plant of height of 3,0m or more;
- (b) the use of explosives;
- (d) construction work that will exceed 30 days or 300 person-days;
- (e) excavation work deeper than 1,0m; or
- (e) working at a height greater than 3,0m above ground or landings

The notification must be done in the form of the pro forma included on page T.53 (Forms to be Completed by Successful Tenderer) of the tender document.

A copy of the notification form must be kept on site, available for inspection by inspectors, Employer, Engineer, employees and persons on site.

PB.5**RISK ASSESSMENT**

Before commencement of any construction work during the construction period, the Contractor shall have a risk assessment performed and recorded in writing by a competent person. (Refer Regulation 7 of the Construction Regulations 2003).

The risk assessment shall identify and evaluate the risks and hazards that may be expected during the execution of the work under the contract, and it shall include a documented plan of safe work procedures to mitigate, reduce or control the risks and hazards identified. This risk assessment is to include present Covid 19 epidemic and other epidemics/pandemics declared.

The risk assessment shall be available on site for inspection by inspectors, Employer, Engineer, subcontractors, employees, trade unions and health and safety committee members, and must be monitored and reviewed periodically by the Contractor.

PB.6**APPOINTMENT OF EMPLOYEES AND SUB-CONTRACTORS****PB.6.1****Health and Safety plan**

The Contractor shall appoint his employees and any subcontractors to be employed on the contract, in writing, and he shall provide them with a copy of his documented Health and Safety Plan, or relevant sections thereof. The Contractor shall ensure that all subcontractors and employees are committed to the implementation of his Safety Plan. The subcontractor will submit a separate health and safety plan for his scope of works.

PB.6.2**Health and safety induction training**

The Contractor shall ensure that all employees under his control, including subcontractors and their employees, undergo a health and safety induction training course by a competent person before commencement of construction work. No visitor or other person shall be allowed or permitted to enter the site of the works unless such person has undergone health and safety training pertaining to hazards prevalent on site.

This induction should include Covid 19 and any other epidemic/pandemic declared, regulations and safety aspects.

No visitor or other person shall be allowed or permitted to enter the site of the works unless such person has undergone health and safety training pertaining to hazards prevalent on site.

The Contractor shall ensure that every employee on site shall at all times be in possession of proof of the health and safety induction training issued by a competent person prior to commencement of construction work.

PB.7**APPOINTMENT OF SAFETY PERSONNEL****PB.7.1****Construction Supervisor**

The Contractor shall appoint a full-time Construction Supervisor with the duty of supervising the performance of the construction work.

He may also have to appoint one or more competent employees to assist the construction supervisor where justified by the scope and complexity of the works.

PB.7.2**Construction safety officer**

Taking into consideration the size of the project and the hazards or dangers that can be expected, the Contractor shall appoint in writing a full-time or part-time Construction Safety Officer if so decided by the Inspector of the Department of Labour. The Safety Officer shall have the

necessary competence and resources to perform his duties diligently.

Provision shall be made by the Contractor in his rates, to cover the cost of this dedicated construction safety officer appointed after award of the contract.

PB.7.3 Health and safety representatives

In terms of **Section 17 and 18 of the Act (OHSA 1993)** the Contractor, being the employer in terms of the Act for the execution of the contract, shall appoint a health and safety representative whenever he has more than 20 employees in his employment on the site of the works. The health and safety representative must be selected from employees who are employed in a full-time capacity at a specific workplace.

The number of health and safety representatives for a workplace shall be at least one for every 100 employees.

The function of health and safety representative(s) will be to review the effectiveness of health and safety measures, to identify potential hazards and major incidents, to examine causes of incidents (in collaboration with his employer, the Contractor), to investigate complaints by employees relating to health and safety at work, to make representations to the employer (Contractor) or inspector on general matters affecting the health and safety of employees, to inspect the workplace, plant, machinery etc. on a regular base, to participate in consultations with inspectors and to attend meetings of the health and safety committee.

Further to these above measures, the Health and Safety officer is to check that all regulations related to Covid 19, are applied/carried out on site.

PB.7.4 Health and safety committee

In terms of Sections 17 and 18 of the Act (OHSA 1993) the Contractor (as employer), shall establish one or more health and safety committee(s) where there are two or more health and safety representatives at a workplace. The persons selected by the Contractor to serve on the committee shall be designated in writing.

The function of the health and safety committee shall be to hold meetings at regular intervals, but at least once every three months, to review the health and safety measures on the contract, to discuss incidents related to health and safety with the Contractor and the inspector, and to make recommendations regarding health and safety to the Contractor and to keep record of recommendations and reports made by the committee.

Further to these above measures, the Health and Safety officer is to check that all regulations related to Covid 19, are applied/carried out on site.

PB.7.5 Competent persons

In accordance with the Construction Regulations the Contractor has to appoint in writing competent persons responsible for supervising construction work on each of the following work situations that may be expected on the site of the works.

- (a) Risk assessment and induction training as described in Regulation 7 of the Construction Regulations;
- (b) Fall protection as described in Regulation 8;
- (c) Formwork and support work as described in Regulation 10;
- (d) Excavation work as described in Regulation 11;
- (e) Demolition work as described in Regulation 12;
- (f) Scaffolding work as described in Regulation 14;
- (g) Suspended platform operations as described in Regulation 15;
- (h) Material hoists as described in Regulation 17;
- (i) Batch plant operations as described in Regulation 18;
- (j) Explosive powered tools as described in Regulation 19;
- (k) Cranes as described in Regulation 20;
- (l) Construction vehicle and mobile plant inspections on a daily basis by a

- (m) competent person as described in Regulation 21(1);
- (n) Control of all temporary electrical installation on the construction site as described in Regulation 22;
- (o) Stacking and storage on construction sites as described in Regulation 26; and
- (p) Inspections of fire equipment as described in Regulation 27.

A competent person may be appointed for more than one part of the construction work with the understanding that the person must be suitably qualified and able to supervise at the same time the construction work on all the work situations for which he has been appointed.

The appointment of competent persons to supervise parts of the construction work does not relieve the Contractor from any of his responsibilities to comply with all requirements of the Construction Regulations.

PB.8

RECORDS AND REGISTERS

In accordance with the Construction Regulations the Contractor is bound to keep records and registers related to health and safety on site for periodic inspection by inspectors, the Engineer, the Employer, trade union officials and subcontractors and employees. The following records and registers must be kept on site and shall be available for inspection at all times.

- (q) A copy of the OHS 1993 Construction Regulations 2003;
- (r) A copy of this Health and Safety Specification;
- (s) A copy of the Contractor's Health and Safety Plan (Regulation 4);
- (t) A copy of the Notification of Construction Work (Regulation 3);
- (u) A health and safety file in terms of Regulation 5(7) with inputs by the Construction Safety Officer (Regulation 6(7));
- (v) A copy of the risk assessment described in Regulation 7;
- (w) A full protection plan and the corresponding records of evaluation and training of employees working from elevated positions as described in Regulation 8;
- (x) Drawings pertaining to the design of structures (Regulation 9(3)) and formwork and support work structures (Regulation 10(d)) must be kept on site;
- (y) Pronouncement of the safety of excavations must be recorded in a register to be kept on site (Regulation 11(3)(h));
- (z) A copy of the certificate of the system design for suspended platforms (Regulation 15(3));
- (aa) A notice must be affixed around the base towers of material hoists to indicate the maximum mass load, which may be carried at any one time by material hoists (Regulation 7(5));
- (bb) Maintenance records of material hoists and inspection results must be kept in a record book to be kept on site (Regulation 17(8));
- (cc) A record of any repairs to or maintenance of a batch plant must be kept on site (Regulations 18(9));
- (dd) A warning notice must be displayed in a conspicuous manner when and wherever an explosive powered tool is used (Regulation 19(2));
- (ee) A register for recording of findings by the competent person appointed to inspect construction vehicles and mobile plant (Regulation 21(1)(j)).
- (ff) Covid 19 register as required.

PB.9

HEALTH AND SAFETY FILE

The contractors H& S file is to include the following, but not limited to;

Health and safety policy statement and appointments

Preparation for mobilization checklist

Compliance officer appointment letters

Employees site induction

Establishment method statement

Safe work practices – general, social distancing, cleaning, screening and monitoring

Procedures in place for the above item.

Addendum to BRA and HS specifications.
Compliance assessment checklist
Contractors work/labour plan

PB.10 CONTRACTORS RESPONSIBILITIES

For this contract the Contractor will be the mandatory of the Employer (Client), as defined in the Act (OHSA 1993), which means that the Contractor has the status of employer in his own right in respect of the contract. The Contractor is therefore responsible for all the duties and obligations of an employer as set out in the Act (OHSA 1993) and the Construction Regulations 2003.

Before commencement of work under the contract, the Contractor shall enter into an agreement with the Employer (Client) to confirm his status as mandatory (employer) for the contract under consideration.

The Contractor's duties and responsibilities are clearly set out in the Construction Regulations 2003 and are not repeated in detail, but some important aspects are highlighted hereafter, without relieving the Contractor of any of his duties and responsibilities in terms of the Construction Regulations.

(a) Contractor's position in relation to the Employer (Client) (Regulation 4)

In accordance with Section 4 of the Regulations, the Contractor shall liaise closely with the Employer or the Engineer on behalf of the Employer, to ensure that all requirements of the Act and the Regulations are met and complied with.

(b) The Principal Contractor and Contractor (Regulation 5)

The Contractor is in terms of the definition in Regulation 2(b) the equivalent of Principle Contractor as defined in the Construction Regulations, and he shall comply with all the provisions of Regulation 5.

Any subcontractors employed by the Contractor must be appointed in writing, setting out the terms of the appointment in respect of health and safety. An independent subcontractor shall however provide and demonstrate to the Contractor a suitable, acceptable and sufficiently documented health and safety plan before commencement of the subcontract. In the absence of such a health and safety plan the subcontractor shall undertake in writing that he will comply with the Contractor's safety plan, the health and safety specifications of the Employer and the Construction Regulations 2003.

(c) Supervision of construction work (Regulation 6)

The Contractor shall appoint the safety and other personnel and employees as required in terms of Regulation 6 and as set out in paragraph 7 above. Appointment of those personnel and employees does not relieve the Contractor from any of the obligations under Regulation 6.

(d) Risk assessment (Regulation 7)

The Contractor shall have the risk assessment made as set out in paragraph 7 above before commencement of the work and it must be available on site for inspection at all times. The Contractor shall consult with the health and safety committee or health and safety representative(s) etc. on a regular basis to ensure that all employees, including subcontractors under his control, are informed and trained by a competent person regarding health hazards and related work procedures.

Risk assessment is to include all Covid 19 related issues, that includes but not limited to the following, health of employees, social distancing, cleaning, screening and monitoring etc.

No subcontractor, employee or visitor shall be allowed to enter the site of works without prior health and safety induction training, all as specified in Regulation 7.

(e) Fall protection (Regulation 8)

Fall protection, if applicable to this contract shall comply in all respects with Regulation 8 of the Construction Regulations.

(f) Structures (Regulation 9)

The Contractor will be liable for all claims arising from collapse or failure of structures if he failed to comply with all the specifications, project specifications and drawings related to the structures, unless it can be proved

That such collapse or failure can be attributed to faulty design or insufficient design standards on which the specifications and the drawings are based.

In addition, the Contractor shall comply with all aspects of Regulation 9 of the Construction Regulations.

(g) Formwork and support work (Regulation 10)

The Contractor will be responsible for the adequate design of all formwork and support structures by a competent person.

All drawings pertaining to formwork shall be kept on site and all equipment and materials used in formwork, shall be carefully examined and checked for suitability by a competent person. The provisions of Regulation 10 of the Construction Regulations shall be followed in every detail.

(h) Excavation work (Regulation 11)

It is essential that the Contractor shall follow the instructions and precautions in the Standard Specifications and Project Specifications as well as the provisions of the Construction Regulations to the letter as unsafe excavations can be a major hazard on any construction site. The Contractor shall therefore ensure that all excavation work is carried out under the supervision of a competent person, that inspections are carried out by a Professional Engineer or Technologist, and that all work is done in such a manner that no hazards are created by unsafe excavations and working conditions.

Supervision by a competent person will not relieve the Contractor from any of his duties and responsibilities under Regulation 11 of the Construction Regulations.

(i) Demolition work (Regulation 12)

Whenever demolition work is included in a contract, the Contractor shall comply with all the requirements of Regulation 12 of the Construction Regulations. The fact that a competent person has to be appointed by the Contractor does not relieve the Contractor from any of his responsibilities in respect of safety of demolition work.

(j) Tunneling (Regulation 13)

The Contractor shall comply with Regulation 13 wherever tunneling of any kind is involved.

(k) Scaffolding (Regulation 14)

The Contractor shall ensure that all the provisions of Regulation 14 of the Construction Regulations are complied with. [Note: Reference in the Regulations to "Section 44 of the Act" should read "Section 43 of the Act"].

(l) Suspended platforms (Regulation 15)

Wherever suspended platforms will be necessary on any contract, the Contractor shall ensure that copies of the system design issued by a Professional Engineer are submitted to the Engineer for inspection and approval. The Contractor shall appoint competent persons as supervisors and competent scaffold erectors, operators and inspectors and ensure that all

work related to suspended platforms are done in accordance with Regulation 15 of the Construction Regulations.

(m) Boatswain's chain (Regulation 16)

Where boatswain's chains are required on the construction site, the Contractor shall comply with Regulation 16.

(n) Material Hoists (Regulation 17)

Wherever applicable, the Contractor shall comply with the provisions of Regulation 17 to the letter.

(o) Batch plants (Regulation 18)

Wherever applicable, the Contractor shall ensure that all lifting machines, lifting tackle, conveyors, etc. used in the operation of a batch plant shall comply with, and that all operators, supervisors and employees are strictly held to the provisions of Regulation 18. The Contractor shall ensure that the General Safety Regulations (Government Notice R1031 of 30 May 1986), the Driven Machinery Regulations (Government Notice R295 of 26/2/1988) and the Electrical Installation Regulations (Government Notice R2271 of 11/10/1995) are adhered to by all involved.

In terms of the Regulations, records of repairs and maintenance shall be kept on site.

(p) Explosive powered tools (Regulation 19)

The Contractor shall ensure that, wherever explosive-powered tools are required to be used, all safety provisions of Regulation 19 are complied with.

It is especially important that warning notices are displayed and that the issue and return of cartridges and spent cartridges be recorded in a register to be kept on site.

(q) Cranes (Regulation 20)

Wherever the use of tower cranes becomes necessary, the provisions of Regulation 20 shall be complied with.

(r) Construction vehicles and mobile plant (Regulation 21)

The Contractor shall ensure that all construction vehicles and plant are in good working condition and safe for use, and that they are used in accordance with their design and intended use. The vehicles and plant shall only be operated by workers or operators who have received appropriate training, all in accordance with all the requirements of Regulation 21.

All vehicles and plant must be inspected on a daily basis, prior to use, by a competent person and the findings must be recorded in a register to be kept on site.

(s) Electrical installation and machinery on construction sites (Regulation 22)

The Contractor shall comply with the Electrical Installation Regulations (Government Notice R2920 of 23 October 1992) and the Electrical Machinery Regulations (Government Notice R1953 of 12 August 1993). Before commencement of construction, the Contractor shall take adequate steps to ascertain the presence of, and guard against dangers and hazards due to electrical cables and apparatus under, over or on the site.

All temporary electrical installations on the site shall be under the control of a competent person, without relieving the Contractor of his responsibility for the health and safety of all workers and persons on site in terms of Regulation 22.

(t) Use of temporary storage of flammable liquids on construction (Regulation 23)

The Contractor shall comply with the provisions of the General Safety Regulations (Government Notice R1031 of 30 May 1986) and all the provisions of Regulation 23 of the Construction Regulations to ensure a safe and hazard-free environment to all workers and other persons on site.

(u) Water environments (Regulation 24)

Where construction work is done over or in close proximity to water, the provisions of Regulation 24 shall apply.

(v) Housekeeping on Construction sites (Regulation 25)

Housekeeping on all construction sites shall be in accordance with the provisions of the environment Regulations for workplaces (Government Notice R2281 of 16 October 1987) and all the provisions of Regulation 25 of the Construction Regulations.

(w) Stacking and storage on construction sites (Regulation 26)

The provisions for the stacking of articles contained in the General Safety Regulations (Government Notice R1031 of 30 May 1986) as well as all the provisions Regulation 26 of the Construction Regulations shall apply.

(x) Fire precautions on construction sites (Regulation 27)

The provisions of the Environmental Regulations for Workplaces (Government Notice R2281 of 16 October 1987) shall apply.

In addition, the necessary precautions shall be taken to prevent the incidence of fires, to provide adequate and sufficient fire protection equipment, sirens, escape routes etc. all in accordance with Regulation 27 of the Construction Regulations.

(y) Construction welfare facilities (Regulation 28)

The Contractor shall comply with the construction site provisions as in the Facilities Regulations (Government Notice R1593 of 12 August 1988) and the provisions of Regulation 28 of the Construction Regulations.

(z) Non-compliance with the Construction Regulations 2003

The foregoing is a summary of parts of the Construction Regulations applicable to all construction projects.

The Contractor, as employer for the execution of the contract, shall ensure that all provisions of the Construction Regulations applicable to the contract under consideration are complied with to the letter.

Should the Contractor fail to comply with the provisions of the Regulations 3 to 28 as listed in Regulation 30, he will be guilty of an offence and will be liable, upon conviction, to the fines or imprisonment as set out in Regulation 30.

The Contractor is advised in his own interest to make a careful study of the Act and the Construction Regulations as ignorance of the Act and the Regulations will not be accepted in any proceedings *related to non-conformance to the Act and the Regulations*.

PB.10 MEASUREMENT AND PAYMENT**PB.10.1 Principles**

It is a condition of this contract that Contractors, who submit tenders for this contract, shall make provision in their tenders for the cost of all health and safety measures during the construction process. All associated activities and expenditure are deemed to be included in the Contractor's tendered rates and prices.

(a) Safety personnel

The Construction Supervisor, the Construction Safety Officer, Health and Safety Representatives, Health and Safety Committee and Competent Persons referred to in clauses 7.1 to 7.5 shall be members of the Contractor's personnel, and no additional payment will be made for the appointment of such safety personnel.

(b) Records and Registers

The keeping of health and safety-related records and registers as described in PB8 is regarded as a normal duty of the Contractor for which no additional payment will be considered, and which is deemed to be included in the Contractor's tendered rates and prices.

PC : **ENVIRONMENTAL MANAGEMENT PLAN****PC.1** **PLANS**

Prior to establishment of the site camp(s), the Contractor shall produce a plan showing the positions of all buildings, laydown yards, vehicle wash areas, fuel storage areas, batching areas and other infrastructure for approval by the Engineer.

PC.2 **USE OF LAND**

The Contractor shall not use the land comprising the Works or any land connected to the Works, for any purpose whatsoever other than for the proper carrying out of the Works and shall place any camps that may be required for himself and his employees only on sites approved by the Engineer.

No trees or bushes shall be damaged or cut down by the Contractor or by any of his employees whether for use in the Works or otherwise without the written consent of the Engineer.

PC.3 **VEGETATION CLEARANCE****PC.3.1** **Woody vegetation**

PC.3.1.1 Prior to the start of construction, woody vegetative matter shall, where directed in writing by the Engineer, be stripped. This material shall either be spread randomly throughout the surrounding veld so as to provide biomass for other micro-organisms and habitats for small mammals and birds, or it may be stockpiled for later redistribution over the reinstated top soiled surface.

PC.3.1.2 No vegetative matter shall be burnt or removed for firewood.

PC.3.2 **Herbaceous vegetation**

During clearing of woody vegetation, no basal cover or grass and topsoil shall be removed and damage to this layer shall be minimized as far as possible.

PC.4 **PROTECTION OF VEGETATION**

The Contractor shall ensure that all works are undertaken in such a manner that vegetation outside the Works area is not damaged.

PC.4.1 **Vegetation within or adjacent or outside the Works area**

The following provisions shall apply with respect to the protection of areas of vegetation.

PC.4.1.1 No tree or shrub shall be felled, lopped, cut or pruned without the prior written approval of the Engineer;

PC.4.1.2 No tree or shrub shall be felled, lopped, cut or pruned until it has been clearly marked for this purpose by the Engineer;

PC.4.1.3 No tree shall be burned for any reason;

PC.4.1.4 For every tree protected by these specifications, which is removed or, in the opinion of the Engineer, is unduly damaged by the Contractor, the Contractor shall pay a penalty of R2000,00 per tree to the Employer;

PC.4.1.5 Trees which have been selected for preservation by the Engineer shall be fenced around their drip line. The fence shall be clearly marked with danger tape. No open fires shall be allowed within this fenced area, nor shall vehicles be parked underneath these trees. The area shall also not be used for material storage or as allocation for temporary buildings; and

PC.4.1.6 Where such trees are located within the working width of the pipeline, the pipeline shall be aligned to avoid these trees wherever possible.

PC.4.2 Transplantation of rare and endangered plant species

Prior to vegetation clearing, any rare or endangered plant species which have been identified by the Engineer or his environmental representative must be removed and transplanted as instructed herein.

PC.4.2.1 Transplanting of small trees (1 to 1,5m height) and small shrubs (0,5 to 1m height)

- a. Trees and shrubs shall only be transported between the months of April and OCTOBER. Deciduous trees and shrubs shall be transplanted only when they are in a leafless condition.
- b. Holes for transplanting trees and shrubs shall be dug before these plants are dug out. Trees shall be planted in holes of 1m x 1m x 1m and shrubs shall be transplanted in holes of 600mm x 600mm x 600mm.
- c. Trees and shrubs shall be planted so that their stems or trunks are at the same depth as in their original location. The orientation of the transplanted plants must be the same as in their original location (i.e. the north-facing side of the plant must remain north-facing after it has been planted.)
- d. Transplanted plants shall be pruned to limit transpiration. Plants shall also be sprayed with an evapotranspiration retardant liquid if they are evergreen.
- e. Transplanted plants shall be watered once a week for 5 weeks and thereafter once every 2 weeks.

PC.4.2.2 Transplanting aloes, succulents and bulbous plants

- a. Aloes, succulents and evergreen bulbous plants may be transplanted at any time of the year.
- b. Aloes and bulbous plants shall be planted in similar conditions and to the same depth as they were before they were removed.
- c. Transplanted aloes and bulbs shall be watered once directly after transplanting to settle the soil.

PC.4.3 Alien vegetation

The Engineer may instruct the Contractor to remove alien vegetation from the works area for the duration of the construction and maintenance period. Such vegetation will be identified by the Engineer or his environmental representative and the method of eradication will be specified by him/her.

The use of topsoil for rehabilitation contaminated with the seed of alien vegetation will not be permitted.

PC.5 PROTECTION OF FAUNA

The Contractor shall ensure that all Works are undertaken in such a manner which minimizes the impact on the local fauna and shall apply the following specifications with respect to fauna management and protection:

PC.5.1 Under no circumstances shall any animals be handled, removed, killed or interfered with by the Contractor, his subcontractors or his subcontractors' employees;

PC.5.2 The Contractor and his employees shall not bring any domestic animals onto the site;

- PC.5.3 The contractor shall ensure that the work site is kept clean and tidy and free from rubbish which would attract animal pests;
- PC.5.4 There shall be no feeding of animals;
- PC.5.5 The Contractor shall ensure that domestic and native animals belonging to the local community shall be kept away and are safe from unprotected works; and
- PC.5.6 The Contractor shall advise his workers of the penalty associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act 71 of 1962) sec. 2 (fine of R2 000 and/or 12 months imprisonment).
- PC.6 ARCHAEOLOGICAL ARTIFACTS**
- PC.6.1 Known archaeological sites shall be indicated by the Engineer and shall be protected by a three strand fence which will be at least 2m outside the extremities of the site. The fence shall be clearly marked with danger tape.
- PC.6.2 Should the Contractor expose any archaeological artefacts during excavation, work on the area where the artefacts were found shall cease immediately and the Engineer shall be notified as soon possible.
- PC.6.3 Upon receipt of such notification, the Engineer will arrange for the excavation to be examined by an Archaeologist as soon as practicable. Acting upon the advice from the Archaeologist, the Engineer will advise the Contractor of the necessary actions to be taken.
- PC.6.4 Under no circumstances shall archaeological artefacts be removed, destroyed or interfered with by the Contractor, his employees, his subcontractors or his subcontractors' employees.
- PC.6.5 The Contractor shall ensure that none of his employees gain access to any archaeological areas (whether fenced or unfenced), except when authorised to do so by the Engineer.
- PC.6.6 The Contractor shall stay strictly within the 20m working width of the Works in order to prevent disturbance of possible grave sites and remnant settlements. Should any work be necessary outside of the working width, then this shall only be done in areas approved by the Engineer.
- PC.7 SCENIC QUALITY**
- PC.7.1 The Contractor shall not establish or undertake any activities which, in the opinion of the Engineer, are likely to adversely affect the scenic quality of the area. The Engineer may direct the Contractor to refrain from such activities or to take ameliorative actions to reduce the adverse effect of such activities on the scenic quality of the environment.
- PC.7.2 No painting or marking of natural features shall be done. Marking for surveying and other purposes shall only be done with pegs and beacons.
- PC.7.3 All cut and fill forms shall be rounded at the edges to blend then with the surrounding landforms.
- PC.7.4 Where instructed by the Engineer, all packed and exposed rock cuttings shall be treated in order to blend their colour with the colours of the natural weathered rocks of the adjacent environment.
- PC.7.5 Where instructed by the Engineer, all concrete structures shall be treated so as to blend in with the colours of the surrounding landscape. This shall be done either through painting or through treatment with a staining or coloration compound. All other permanent structures shall have colours which are chosen to blend in with the dominant colours of the surrounding landscape. Painted surfaces shall be painted with non-reflective (matt) colours.

PC.8 WORKING AREA

PC.8.1 The area of construction along any pipeline shall be contained within a 20m working width.

PC.9 ACCESS ROADS AND VEHICLE TURNING AREAS

PC.9.1 No new permanent access roads other than those agreed to by the Engineer shall be developed by the Contractor.

PC.9.2 Existing roads shall be used as far as possible for inspection purposes.

PC.9.3 Topsoil shall be stripped as specified prior to construction and reinstated on completion of the use of the road.

PC.9.4 Any temporary access road shall form part of the 20m working width servitude.

PC.5.5 All new temporary access roads shall be approved by the Engineer. No deviation from the approved access roads shall be allowed.

PC.9.6 Horse and trailer vehicles transporting pipes may not turn in areas of cultivated lands but shall turn in areas specifically identified by the Engineer.

PC.10 MATERIAL LAYDOWN AREAS

Pipe and materials shall be stored within the pipeline servitudes. Where this is not convenient or in the interests of efficiency, other areas may be designated by the Engineer.

PC.11 FIRES

No open fires shall be permitted except in areas specifically prepared and controlled for this purpose.

PC.12 FENCING

PC.12.1 Where instructed by the Engineer, fencing shall be erected around sensitive natural or cultural elements to protect them from damage. No pedestrian or vehicular access shall be allowed into such fenced areas.

PC.12.2 In places where temporary fencing is required, the Contractor shall erect such fencing when and where required by the Engineer and re-erect and maintain temporary fencing as necessary. Temporary fencing shall remain in position either until it is replaced by permanent fencing or until completion of the whole of the Works, unless the Contractor requires, or the Engineer directs its earlier removal.

PC.12.3 If any fencing is removed temporarily for the execution of any part of the Works it shall be reinstated as soon as practicable by the Contractor.

PC.12.4 The clearing for permanent fencing shall be limited to the removal of trees and shrubs within 1m of the fence line. Where, possible, the fence line must be aligned to retain trees or groups of trees. There shall be no removal of the grass cover or topsoil within this width.

PC.12.5 Any fences damaged by the Contractor shall be repaired as soon as practicable at his cost.

PC.13 TOPSOIL**PC.13.1 Source of topsoil**

Topsoil shall be stripped from all areas that are to be utilized during the construction period and where permanent structures and access is required. These areas will include all areas to be excavated, the pipeline trench route, temporary and permanent access roads, construction camps, laydown areas, pump sites, valve chambers and borrow pits. Topsoil shall be stripped after clearing of woody vegetation and before excavation or construction commences.

The topsoil is regarded as the top 150mm of the soil profile, irrespective of the fertility appearance, agricultural potential, structure and composition of the soil.

PC.13.2 Topsoil stripping

PC.13.2.1 Soil shall be stripped to the depth indicated in the project specification, or to the depth of the bedrock where soil is shallower than that specified. Herbaceous vegetation, overlying grass and other fine organic matter shall not be removed from the stripped soil.

PC.13.2.2 No topsoil which has been stripped shall be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction by machinery.

PC.13.2.3 Topsoil shall preferably be stripped when it is in a dry condition in order to prevent compaction.

PC.13.3 Topsoil stockpiling

PC.13.3.1 Stripped topsoil shall be stockpiled on sites adjacent to where it has been stripped which have been approved by the Engineer. Soil stockpiles shall not take the form of windrows, unless this can be placed far enough away from the working area. This is to prevent the soil from being spread out or mixed with the other spoil during construction.

PC.13.3.2 No vehicles shall be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles shall be clearly demarcated in order to prevent vehicle access and later for identification as being the resource for rehabilitation and vegetation establishment.

PC.13.3.3 Stockpiles shall not be allowed to become contaminated with oil, diesel, petrol, garbage or any other material which may inhibit the later growth of vegetation in the soil.

PC.13.4 Topsoil placement

PC.13.4.1 Topsoil shall be placed to the depth indicated in the project specification over all areas where it has been stripped and over disused borrow pits after construction in those areas has ceased. Topsoil placement shall be done concurrently with construction or as soon as construction in an area has ceased.

PC.13.4.2 Topsoil shall be placed in the same soil zone from which it has been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be bought from other soil zones of similar quality at the approval of the Engineer.

PC.13.4.3 Topsoil shall be mounded and shaped around manholes and valve chambers which protrude above the ground and over the pipeline to facilitate subsequent consolidation of the backfill. The Contractor shall ensure that stormwater run-off is not channelled alongside the gentle mounding but is taken diagonally across it.

PC.13.4.4 Where insufficient topsoil has been stripped by the Contractor to provide the minimum specified depth, the Contractor shall obtain suitable substitute material from other sources at no cost to the employer. The suitability of the substitute material shall be determined by means of a soil analysis which is acceptable to the Engineer or Environmental Officer.

PC.13.4.5 No vehicles shall be allowed access onto or through topsoil areas after it has been placed.

- PC.13.4.6 After topsoil placement is complete, cleared and stockpiled vegetation matter shall be spread randomly by hand over the top soiled area as instructed by the Engineer.

PC.14 BORROW PITS AND QUARRIES

- PC.14.1 If a borrow pit is to be developed or an existing one is to be excavated, all topsoil from the area that is to be quarried must be stripped and stored for later rehabilitation of the pit.
- PC.14.2 Stripping and excavation actions shall be progressive in such manner that those parts of the borrow pit or quarry where work is complete can be rehabilitated while other areas are still being quarried.
- PC.14.3 Cut slopes of borrow pits and quarries shall have a vertical: horizontal gradient of not steeper than 1:3 (about 18 degrees), and preferably 1:5.
- PC.14.4 During excavation, work will be carried out in such a way that slopes of open works are not made dangerously steep.
- PC.14.5 Borrow pits shall be used as dump sites for excess rock spoil. On completion of spoiling the pits shall be reshaped and covered with layer of topsoil. On no account may spoil or rock be placed in drainage ways without the prior consent of the Engineer. On sites where old excavations are to be found, rock, waste and mud from new excavations will be used to fill in the old excavations.
- PC.14.6 Stormwater cut off drains shall be provided at the top of the cut slope, where identified as necessary by the Engineer, to prevent erosion of the rehabilitated surface of the borrow pit or quarry.
- PC.14.7 No borrow pit shall be used as a dump site for refuse material or for toxic material e.g. cement, oil, diesel, rubber and similar materials.
- PC.14.8 There will be no workshops, chemical or fuel stores on the borrow pit site.
- PC.14.9 Sufficient soil conservation works for preventing soil erosion will be established at the rehabilitated areas.

PC.15 BATCHING

Concrete shall be mixed only in areas which have been specially demarcated for this purpose. All concrete that is spilled outside these areas, shall be promptly removed by the Contractor and taken to an approved dump site. After all concrete mixing is complete, all waste concrete shall be removed from the batching area and disposed of at an approved dump site. Stormwater shall not be allowed to flow through the batching area. Water laden with cement shall be collected in a retention area for evaporation.

PC.16 EROSION PREVENTION

- PC.16.1 The Engineer will instruct the Contractor on the measures to be taken to ensure that there is no undue stormwater damage and soil erosion resulting from the construction activities. The Contractor shall nevertheless take interim measures to ensure that no undue erosion damage occurs and shall advise the Engineer of all potential problem areas.
- PC.16.2 Surface stormwater shall, where possible, not be allowed to be concentrated and to flow down cut or fill slopes or along the pipeline route without erosion protection measures being place.
- PC.16.3 Stormwater deflection berms or stone pitched channels shall be constructed at regular intervals (plus minus every 15-30m) diagonally across the pipeline servitude on slopes as directed by the Engineer.

PC.17 EARTHWORKS

PC.17.1 All cut and fill forms shall be rounded on the edges to allow them to blend with the surrounding landforms.

PC.17.2 Where the backfill over the pipe trench will impede the natural flow of water, the backfill shall be shaped to allow an even flow across the line.

PC.19 SPOIL AND WASTE MATERIAL

PC.19.1 The Contractor shall load and haul excess spoil to fill in the borrow pits or to dump sites approved by the Engineer. The dumped material must be finally rounded to have slopes not steeper than 1:3.

PC.19.2 The Contractor shall remove all foundations and similar waste and transport all such waste material off site to dump areas which have been approved by the Engineer.

PC.20 REFUSE DISPOSAL

The Contractor shall dispose of all refuse generated by him or his subcontractor on a weekly basis at an approved refuse disposal site.

PC.21 ABLUTION FACILITIES

Portable toilets shall be placed within easy access of the Contractor's employees. These toilets shall be moved to follow the progression of the Works. Waste generated by these toilets shall be disposed of in an acceptable manner following consultation with the Engineer.

PC.22 CLEARANCE OF SITE ON COMPLETION

PC.22.1 On completion of the Works, the Contractor shall clear away and remove from the works area all constructional plant, signboards, surplus rock and other material, foundations, plumbing and other fixtures, rubbish and temporary works of every kind. Areas thus cleared shall be graded and scarified to restore the ground to its original profile as near as practicable before topsoil placement and re-vegetation.

PC.22.2 The Contractor shall load and haul excess spoil to fill the borrow pits or to dump sites approved by the Engineer. The dumped material must be finally rounded off to have slopes not steeper than 1:3.

PC.23 ENVIRONMENTAL AWARENESS OF EMPLOYEES

The Contractor shall arrange that all his employees and those of his subcontractors receive environmental awareness and/or training before commencement of construction to the satisfaction of the Engineer, in order that they:

PC.23.1 acquire a basic understanding of the key environmental features of the work site and environs;
PC.23.2 are thoroughly familiar with the requirements of these Environmental Protection and Control Specifications as they apply to the Works;

PC.23.3 if required by the Engineer, receive basic training in the identification of archaeological artifacts, and rare and endangered flora and fauna that may be encountered along the route; and

PC.23.4 are made aware of any other environmental matters which are deemed to be necessary by the Engineer.

PC.24 COMPLIANCE WITH ENVIRONMENTAL PROTECTION SPECIFICATION

- PC.24.1 All persons employed by the Contractor or his subcontractors shall abide by the requirements of these specification as they apply to the Works.
- PC.24.2 Any employees of the Contractor or his subcontractors found to be in breach of any of the Environmental Protection Specifications may be ordered by the Engineer to leave site forthwith. No extension of time will be granted for any delay or impediment to the Contractor brought about by a person ordered to leave the site.
- PC.24.3 Supervisory staff of the Contractor and his subcontractor shall not direct any person to undertake any activities which would place such a person in contravention of the Environmental Protection and Control Specification.

PC.25 COMPLIANCE AND MONITORING

The Engineer shall be responsible for implementing a consistent monitoring programme to ensure that construction specifications are upheld and that negative environmental impacts are regularly assessed and mitigated against.

The Contractor shall obtain written approval from the Engineer that the site is rehabilitated to their satisfaction at the end of the contract (practical closure) as well as after a 12-month liability period (final closure). If, in the opinion of the Engineer, the Environmental Protection and Control Specifications have not been complied with, further rehabilitation measures can be specified, the costs of which will be borne by the Contractor.

PD: PROVISION OF STRUCTURED TRAINING**CONTENTS**

Scope

Generic training

Entrepreneurial skills training

In-service training

Measurement and payment

PD.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.

PD.2 GENERIC TRAINING

PD.2.1 The contractor shall, from the commencement of the contract, implement a structured progressive training programme.

PD.2.2 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. Brick laying		
2. Pipe laying		
3. Concrete handling, placing and finishing		
4. Plumbing		

PD.2.3 Training shall be at or by an approved accredited organisation and shall be delivered by suitably qualified and experienced trainers.

PD.2.4 The tenderer shall provide with his tender full details of the structured training programme he intends to implement; which details shall include the following:

- (a) The name of the training institution and programme
- (b) The manner in which the training is to be delivered.
- (c) The numbers and details of the trainers

PD.2.5 The contractor shall be responsible for the provision of everything necessary for the delivery of the generic training programme, including the following:

- (a) A suitable venue with sufficient furniture, lighting and power.
- (b) All necessary stationery consumables and study material
- (c) Transport of the students (as necessary)
- (d) 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.

- (e) relevant PPE required for the project works
(f) Additional supervision of learners during the practical learning stages of the works. Wage for the learners during this stage of the training will be paid through the outputs.

- PD.2.6 Generic training courses shall commence within one month of possession of site and be completed before the end of the contract period.
- PD.2.7 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.
- PD.2.8 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.

PD.3 ENTREPRENEURIAL SKILLS TRAINING

- PD.3.1 Small contractors and subcontractors will be entitled to receive a structured training programme, which will comprise both management skills as well as business development skills.
- PD.3.2 The contractor shall closely monitor the performance of all small subcontractors in the execution of their contracts and shall identify all such subcontractors who, in his opinion, display the potential to benefit from structured training as may be provided for in the contract and where required by the engineer, shall make recommendations in this regard. The final list of candidates will be decided between the contractor and the engineer.
- PD3.3 The training will be delivered by trainers who are accredited by the Civil Engineering Training Scheme (CEITS) or other institutions recognised by the Department of Labour. Accredited training refers to both the trainers as well as to the training material.
- PD3.4 The contractor shall facilitate in the delivery thereof, by instructing and motivating the subcontractor regarding attendance and participation therein.
- PD.3.5 The contractor shall further make all reasonable efforts to co-ordinate the programming of the subcontractor.
- PD.3.6 The structured training will comprise out of the following as decided by the Employer:

Course Description	Estimated Duration (Days)
1. Basic Business Principles	
2. Basic Supervision	
3. Running A Business	
4. Legal Principles	
5. Achieving Standards	

- PD.3.7 The contractor shall provide with his tender, full details of the structured training programme, which he intends to implement, which details shall include the following:
- (a) The name of the training institution and programme
(b) The various aspects of each type of training comprised in the programme

- (c) The manner in which the training is to be delivered
- (d) The numbers and details of the trainers to be utilised.

PD.3.8 The contractor shall be responsible for the provision of everything necessary for the delivery of the entrepreneurial training programme, including the following:

- (a) A suitably furnished venue (if required) with lighting and power.
- (b) All necessary consumables, stationery and study material
- (c) Transport of the subcontractors (as necessary)

PD.3.9 All entrepreneurial training shall take place within normal working hours.

PD.3.10 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.

PD.3.11 The contractor shall keep comprehensive records of the training given to each subcontractor and whenever required shall provide copies of such records to the engineer. At the successful completion of each course each subcontractor 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

PD.4. IN SERVICE TRAINING

PD.4.1 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.

PD.4.1.1 Details of in-service training

- (i) 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:
 - the details of training to be provided
 - the manner in which the training is to be delivered
 - the number and details of trainers to be utilised.
- (ii) 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.
- (iii) 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.
- (iv) All labourers shall be remunerated in respect of all time spent undergoing training.
- (v) 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:
 - the name of the contractor
 - the name of the employee
 - the name of the project/contract
 - the nature of the work satisfactorily executed by the worker and the time spent thereon
 - the nature and extent of training provided to the worker
 - the dates of service.
- (vi) The cost of the above obligations shall be deemed to be covered by the sums and rates tendered for items B13.01(a), (b) and (c) 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.

PD.4.1.2**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.

PD.5**MEASUREMENT AND PAYMENT**

	ITEM	UNIT
	E12.05 Provision for training	
(a)	Generic skills Provisional (list training courses)	sum
(b)	Entrepreneurial skills Provisional	sum

- (c) Handling cost and profit in respect of sub-item E12.05(a) and (b) above percentage (%)
- (d) Training venue (only if required) lump sum
- (e) Transport and accommodation of workers for training where it is not possible to undertake the training in close proximity to the site. (provisional sum) sum
- (f) Additional supervision during practical training Lump sum

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) 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:

- (i) 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.
- (ii) 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) shall include full compensation for the provision of additional supervisory staff to manage the output generated from the learners during practical training.

PG STERILISATION OF TANKS AND RESERVOIRS**PG.1.1 SCOPE**

The structures shall be sterilised before testing and before re-testing for water tightness.

The walls, floors and soffits of roof slabs shall be hosed down and brushed until clean and free from loose material.

The structures shall then be filled with clean water containing 150 g/m³ of calcium hypochloride, to a water depth of 150 mm. The walls shall be thoroughly washed down after which all dirty water shall be flushed out.

Staff doing the washing down with the chlorine solution shall wear rubber boots.

ELECTRICAL WORKS**GS.1 STANDARD SPECIFICATION FOR DB's AND MOTOR CONTROL CENTRES**

All major motor control centres and equipment shall be designed in accordance with SANS 1473/60439. The equipment shall conform to SANS 60947 Parts 1-7, unless otherwise stated and shall be suitable for operation on supply voltages of 230/400 Volts and 500/550 Volts, 50Hz, AC. Reference SHALL be made to the detailed technical specification, the relevant line diagram if provided, as well as the following specific requirements.

In addition the design must conform to the following standards:

- Act No. 85 of 1993 Occupational Health and Safety Act.
- SANS 10142 Code of Practice for the Wiring of Premises
- Relevant SANS specifications and Codes of Practice
- Relevant BSI Specifications and Codes of Practice in the absence of published
- SANS documents.
- Relevant IEC Specifications and Codes of Practice shall be used in the absence of published SANS and BSI documents.

GS.1.1 CONSTRUCTION OF MOTOR CONTROL CENTRE ASSEMBLIES

All motor control centres shall generally be of the free standing, floor mounted, individual starter with local isolator for each motor type, with front and back access, suitable for bottom cable entries from cable trenches below the assembly. The schematic drawings or project specification show the specific requirements applicable to each assembly. In certain instances wall mounted control centres may be required as specified.

The assembly will be constructed of powder coated 3CR-12 having a minimum thickness of 2mm except for gland plates which shall be a minimum of 3mm. If thinner material is offered, offered, the construction technique must be approved by the Employer's representative prior to fabrication.

Where specified the assembly enclosure may be required to be manufactured from stainless steel.

The degree of protection shall not be less than IP 43, in accordance with SANS 1222 and capable of withstanding the temperature, humidity and conditions normally associated with heavy industrial applications. The assembly shall be fully vermin proofed.

A hot dipped galvanized steel base frame shall be provided and removable lifting eyes with blanking off plugs shall be provided for heavy assemblies. All panels shall be suitably braced to ensure rigidity.

The MCC's are to be fully assembled in the manufacturer's factory for final acceptance tests. Where broken down for transportation to site, the MCC's will be provided with all items required for

re-assembly. Provision must be made for future extension at either side of the MCC. All holes provided for such extension to be suitably plugged or covered.

The overall outside dimensions of the assembly shall be suitable for easy handling of the switchgear. The height of the assembly shall generally not exceed 2100mm above floor level.

All doors shall be fitted with stainless steel or heavy duty rustproof hinges of Barker & Nelson or Zeus manufacture and shall be secured in the closed position by means of locking devices of approved quality. Doors in excess of 450mm height shall be secured at both the top and bottom. Lockable catches are required on all doors. All doors are to be fitted with earth straps.

Covers, other than the hinges type, shall be provided with chromium plated handles to facilitate removal. Removable covers shall be secured in position by means of patent screw locking devices approved by the Employer's Representative. All the equipment shall be mounted behind the doors and neat machine punched openings shall be provided for the purpose of operating handles etc. Employer's Representative's drawings or specifications will detail the instruments required which will be flush mounted. The positions of instruments shall be such that the glass cannot be broken by other equipment when the doors are in the fully open position.

Cut outs which are provided for future equipment and instruments shall be neatly blanked off by means of removable dummy frames. Back plates shall be provided in all spare cubicles for the specified future starters.

The manufacturer's detailed working drawings of the assembly must be approved by the Employer's Representative or Engineer before any fabrication commences. Any other construction or type of assembly proposed as an alternative to that specified, must have the approval of the Employer's Representative in writing. The drawings will detail all dimensions of busbars, connections, electrical components, make, type and rating. Position and layout of busbars, earth bars and gland plates must be shown in front and side elevation drawings.

GS.1.2 PAINT SPECIFICATION

In general, the following standard colours shall be used, but the final colours are to be confirmed with the Employee's Representative.

Non-essential section	Electric orange (Colour B26 – SANS 1091)
Essential sections	Signal red (Colour A11 – SANS 1091)
Uninterrupted power (UPS)	Electric orange (Colour B26 – SANS 1091)
Instrumentation and control	Electric orange (Colour B26 – SANS 1091)

GS.1.3 BUSBARS

All busbars shall be manufactured from solid high conductivity copper and shall comply with the requirements laid down in SANS 1195. The completed busbar system shall be a standard modular

system and shall have been tested to SANS approval and a certificate shall be made available confirming the full busbar technical description, current rating and fault rating together with full details of the test results.

The busbar assembly shall be rated in accordance with the specified ultimate projected faulted level, which will be not less than the short-circuit stresses limited by the protective device(s) on the supply side of the busbars, as well as the specified continuous full load current, with a current density not exceeding 1.60 Amps per mm².

The busbars shall be continuously rated for the specified current with a maximum temperature of 40°C relative to a peak ambient temperature of 40°C giving a maximum peak busbar temperature of 80°C.

Busbars shall be mounted in the top section of the assembly and shall be rigidly supported by means of approved insulated busbar clamps to prevent damage resulting from the specified short circuit conditions.

The busbars shall run along the entire length of the assembly up to 76mm from either end. The phase busbars shall be identified in the phase colours red, white and blue.

The busbars shall be arranged horizontally with the longer side of the cross-section in the vertical plane and one behind the other in the horizontal plane. The minimum clearance between live conductors and live conductors and earth shall be 40mm.

GS.1.4 BUSBAR DROPPERS

All busbar droppers must be suitably supported and braced to suit the specified and/or project short circuit conditions. They should be fully insulated and screened against accidental contact.

The droppers to the supply side of a single functional unit, as well as the components included in this unit, may be rated on the basis of the reduced short-circuit stresses occurring on the load side of the short-circuit protective device in this unit provided that these conductors are arranged such that under normal operating conditions an internal short-circuit between phases and/or between phases and earth is only a remote possibility, for example by being provided with adequate insulation or shrouding.

Particular attention shall be paid to the provision of adequate facilities for making off the main power supply cables. Attention must be paid to the vermin proofing of single core cabling.

Bunched cable connections will not be accepted between busbars and outgoing power circuit breakers, fuses or isolators.

GS.1.5 EARTH BUSBAR

A solid copper earth bar shall be provided inside each assembly at the back and along the entire length, at a height of approximately 500mm above floor level, or 200mm above the gland plates. A bar is to be provided at the top of the assembly where top entries exist and this shall be solidly connected to the bottom earth bar.

The earth bar will be supported on robust spacers and will have a minimum clearance of 40mm to the sheet steel panel.

The earth bar shall have a cross-section of not less than 40mm x 6mm and shall be drilled with the requisite number of holes for the individual connection of all cable ECC and other earth conductors.

High tensile phosphor bronze or cadmium plated nuts, bolts and lock washers shall be provided through the earth bar at each earth position and at least 5 additional holes will be provided for future connections, each being fitted with nuts and bolts as above.

The earthing positions shall be evenly spaced along the length of the earth bar and the bar must be clearly identified as the earth.

GS.1.6 BUSBAR CONNECTIONS

All connections and extensions to busbars shall be effected by means of high tensile phosphor bronze nuts, bolts and washers or cadmium plated, high tensile steel bolts and nuts which shall also be provided for future extensions. The minimum diameter of any holes will be 10mm.

In exceptional cases a relaxation of SANS 1973 may be permitted to allow the drilling of holes, in which case the cross-sectional area as measured is to be reduced by the area of the holes.

GS.1.7 EQUIPMENT

Unless otherwise stated on the drawings or as specified, the latest version of the following minimum specifications shall be assumed for equipment to be installed in the switchboards.

Busbars	SANS 1195
Circuit breakers	SANS 60947 Part 2 and SANS 156
Switches, disconnectors and fuse Combination units	SANS 60947 Part 3
Contactors and motor starters	SANS 60947 Part 4
Control circuit devices and switching Elements	SANS 60947 Part 5
Multi-function switching devices	SANS 60947 Part 6
Ancillary Equipment	SANS 60947 Part 7
HRC fuses and fuse switches	SANS 60269

SANS 60947 relates specifically to equipment for use at voltages up to 500 Volts

Where a voltage in excess of 500 Volts is specified, the manufacturer must confirm that the equipment is suitable and has been tested to that higher voltage.

The equipment to be mounted in the panels will be detailed in the drawings or as specified and schedules provided.

All contactors and/or starters shall be protected with suitable back-up HRC fuses or current limiting circuit breakers to protect the equipment against abnormally high currents or short circuits developing in the system.

The manufacturer will be required to ensure the correct co-ordination between fuses, contactors and overload relays to comply fully with SANS 60947 Part 4 in order to achieve "Type 2" co-ordination. Current limiting circuit breakers will only be permitted if the manufacturer submits full details of tests results confirming to Type 2 co-ordination.

Unless otherwise stated, contactors and/or starters shall be rated for 10 million operations for making and breaking no-load current to category AC3 as laid down in SANS 60947. Note that SANS 60947 requires equipment and wiring to be suitable for $7.2 \times \text{FLC}$ for DOL starters.

Access to the various starters shall be possible without isolation of the entire MCC, but the doors corresponding to each compartment shall be inter-locked with a local isolator in order that any compartment must be isolated before access to the equipment can be obtained. A mechanical device shall be incorporated in each isolation in the off position to provide a locking out facility during maintenance periods.

Timers and relays controlling a starter shall be mounted in the compartment with the starter. All timers and relays must be clearly labelled with the identity given on the schematic diagrams.

GS.1.8 DERATING OF EQUIPMENT

Full cognizance must be taken of manufacturers derating tables of equipment located in enclosures and the rating of that equipment must be increased accordingly. In all such cases labels must be provided on the front of the associated cubicle stating the maximum permitted circuit loading.

Where high ambient temperature and/or continual high loadings are anticipated, the assembly must incorporate adequate ventilation systems to eliminate the possible build-up of excessive temperatures or humidity. Where specified, renewable filter elements must be incorporated.

GS.1.9 CABLE TERMINATIONS

Due to the continuing miniaturization of equipment, difficulties can be experienced in terminating power cables onto equipment terminals, particularly where more than one cable has to be

terminated. The manufacturer shall ensure that suitably designed and rigidly braced copper stubs are extended from such terminals to facilitate the termination of all cables.

GS.1.10 INSTRUMENTATION

All instruments shall be of a matching flush pattern, preferably with a 96mm x 96mm square dial.

All main incoming panels shall be provided with three combined maximum demand/instantaneous ammeters, a voltmeter and selector switch as well as any additional instrumentation detailed on the single line diagrams or as specified.

GS.1.11 AMMETERS

Combined maximum demand type instruments will comprise a moving iron ammeter showing the instantaneous current value, combined with an ambient corrected, manually reset, thermal maximum indicating ammeter which will indicate the mean current reached during any 15 minute period.

The starter cubicles for all motors rated at 2, 2kW and above and all motor driven pumps irrespective of size shall be provided with an ammeter, which shall incorporate an adjustable red pointer and an extended starting characteristic. Allowance must be made for the full load current of all motors to be checked and for all red point to be set accordingly.

GS.1.12 CURRENT TRANSFORMERS

Where applicable, the current transformers shall generally be of the ring type complying with the requirements of SANS 60044-1, as amended. The current transformers shall have a Class 3 or 5 accuracy.

GS.1.13 VOLTMETER

Voltmeters shall be of the moving iron, suppressed zero type, having a full scale deflection of not less than 480 Volts, unless otherwise specified.

GS.1.14 VOLTMETER SELECTOR SWITCH

All voltmeter selector switches shall be wired to connect the voltmeter between all phases and each phase and neutral and shall disconnect it in the OFF position. The switch shall have a position located switching mechanism.

GS.1.15 INSTRUMENTATION FUSES

All instrument fuses shall be mounted in the panel onto or next to the busbars. 6mm² wiring shall be used between the busbars and the fuses and shall be kept as short as possible.

HRC cartridge fuse links to SANS 60269 shall be used and shall incorporate visual indication devices to facilitate the location of blown fuses on visual inspection. They shall be designed to clip into the fuse carrier contacts without the use of fixing screws.

Wiring from fuses bases to instruments may be bunched but must be suitably supported in Bowthorpe Hellerman trunking or lacing.

GS.1.16 PROTECTIVE DEVICES AND PROTECTION SETTING

The switchgear shall be provided with the specified protection and auxiliary relays, which must be of a modular pattern, readily accessible, replaceable and extensible.

The thermal overload releases and instantaneous magnetic short circuit trips are to be adjustable over the trip ranges as specified by the Employer's Representative.

The contractor must allow to grade, set and test the protection devices for the main switch, bus section switches and each motor circuit.

GS.1.17 PUSH BUTTONS AND INDICATING LIGHTS

Unless otherwise indicated, the following is the minimum requirement for illuminated push button and indicating lights:

START and STOP push buttons

RUN, STOP, THERMISTORS and HEATER lights

Indicator lamps may only be of the neon or LED types. Where LED's are used as indicators on main supply voltages, a suitable current limiting capacitor and reverse voltage protection diode must be used. For low AC or DC voltage ($\pm 24V$) a current limiting resistor will suffice.

GS.1.18 CONTROL VOLTAGE SUPPLY /BACK UP SUPPLY

The control voltage shall be provided by a single phase, double wound transformer supplied from the Red and White phases of the main busbars, with the secondary voltage as specified on the schematic diagrams or as specified.

The primary and secondary connections are to be provided by suitably rated and labelled HRC fuses.

Unless otherwise specified, the transformer shall be rated at 0.8 x (total hold-on VA of all contractors plus VA of all lights and relays plus pull-in VA of largest device) with a further additional allowance of 50% for future extensions.

Should the main busbar system incorporate a bus-coupler, 2 control transformers shall be provided. Supplies to the 2 transformers shall be controlled by contactors interlocked to ensure that only one transformer supplies the control circuit at any one time.

Where suitable, a control voltage busbar shall be provided along the length of the MCC. A power supply unit with backup up battery for the PLC is to be installed and wired in a separate cubicle. The 12V DC circuit must be supplied by a 25W DC/DC converter for equipment using 12Volts (eg. room security sensors). Two (2) backup batteries are to be low maintenance sealed lead acid type of 12 V DC 70AH.

GS.1.19 CABLING, WIRING AND TERMINALS

GS.1.19.1 STARTER WIRING

Particular attention shall be paid to be the method of wiring from busbars to the individual compartments, in order to avoid any cable crossing through a compartment with which it is unrelated.

The wiring between all starter components, isolators, fuses, contactors, overload relays and terminals is to be rated to suit the maximum capacity of the starter and is to be not less than 6mm².

Three phase panels shall be wired in red, yellow and blue PVC insulated conductors for the phases, black for neutral and green earthed circuits.

Single phase panels shall be wired in red and black PVC insulated conductors, for phase and neutral respectively and green for earthed circuits.

Neutral connections shall be black and this colour must not be used for any other wiring.

Multi-stranded or laminated conductors shall be used between all items of equipment in preference to solid conductors. The insulation of these conductors shall not be stripped beyond the leading edge of the terminal in which it has to be accommodated.

Stripping shall be carried out without damage to the conductors, preferably by means of a cable stripper.

Approved crimping lugs and ferrules or approved clamps shall be used for connection into equipment not provided with compression type terminals.

All panel wiring shall be completed and installed at the MCC manufacturing works. The wiring shall be loomed or encased in PVC cable trunking of Hellerman manufacture or equal approved and shall be carried out neatly along vertical and horizontal lines.

GS.1.19.2 CONTROL AND INSTRUMENTATION

Suitably protected control supervisory and auxiliary circuits must be wired with 1 mm² conductors. The wire colour codes must be according to SANS 10142-1:2012. Edition 1.8

220 Vac	- Red
Neutral	- Black
+24 Vdc	- Grey (Marked +24Vdc)
-24 Vdc	- Blue
12 Vdc	- Yellow (Marked +12Vdc) -12 Vdc - Blue
Telemetry	- Purple

Each end of the conductor shall be terminated in a pre-insulated, spade or pin type lug, applied by means of the recommended colour coded crimping tool. All control wiring shall be clearly marked by interlocking plastic ferrules, the numbers corresponding to wire numbers on the schematic diagrams.

If control and/or supervisory wiring is required for equipment which is installed on the doors of the panel the wiring shall be bunched together and suitably strapped with spiral binding in the form of a vertical "U" loop between the door and the panel, to ensure that there is no tension on the wiring when the door is rotated along its vertical axis. Approved wiring supports shall be fixed onto the hinged panels, to relieve the weight of the cables off the equipment terminals. Each door shall be suitably earthed.

GS.1.19.3 POWER CABLE TERMINATIONS

Sufficient space must be allowed for the connection of all known and future incoming and outgoing cables.

Outgoing cables shall be glanded off on galvanized gland plates at the bottom or top of the vertical cables ways. Where top access is required, it will be specified in the tender document.

Approved shrouded and shielded terminals shall be provided for the outgoing connections to each motor for conductors up to and including 35mm², rated at least 50% in excess of the conductor rating. The terminals shall be fixed in the vertical cables way of the assembly and shall have ample space for making off the outgoing cable terminations.

Conductors of 50mm² and above shall be terminated directly onto the starter equipment, but the cables must be adequately supported to ensure that no strain is imposed on the equipment.

GS.1.20 GLAND PLATES

A strong and robust 3mm hot dipped galvanized cable gland shall be provided along the entire length of the assembly at a minimum height of 300mm above floor level. The gland plate shall be constructed in sections and bolted in position to take the load of the cables being glanded to it.

When cables enter/exit from the top of the board, the top cover plate will act as the cable gland plate and shall also be 3mm thick. It shall be bolted to the frame so that it can be removed if necessary. The terminals associated with these cables will be mounted not less than 200mm below the top cover plate.

All gland plates shall be machine punched in the factory to suit each and every cable gland required. Under no circumstances will any drilling or filing be allowed on site.

GS.1.21 OUTGOING POWER CIRCUITS

All cables shall be terminated with approved glands to suit the application. Particular attention shall be paid to the termination of ECC cabling to ensure the continuity of all earth conductors.

Every termination of a power cable shall be provided with an approved numbered Bowthorpe Hellerman tag identifying its size and destination, fixed below the cable gland plate in a position which is easily observed from the front to the boards. This procedure must also be incorporated at the motor termination box.

GS1.22 MARSHALLING COMPARTMENTS

When specified, marshalling compartments shall be provided for control circuit wiring.

The marshalling compartment shall be adequately sized to accommodate all the required terminals PLUS provision for a further 50% spare terminals.

Where a motor control centre is to be broken down for transportation to site, each section shall be provided with a marshalling compartment to the above requirement so that the associated wiring is not disturbed.

Where such control circuits are unavoidable and control wiring has to cross a break, it shall be suitably identified and disconnected at one end during transportation.

Terminals for each starter should be grouped together and clearly identified by a permanently affixed label. Terminals shall be mounted on rails and space shall be provided for spare terminals after each group of terminals.

A suitable gland shall be provided for terminating the control cables and adequately sized cable way shall be provided for running the cable ends to the terminals in the marshalling compartment.

A 220 Volt switched socket outlet shall be provided in each marshalling cubicle. Where specified, a switched light shall also be provided.

GS.1.23 SURGE DIVERTERS AND 4-20 MA LOOPS

Where specified the MCC is to be equipped with surge diverters of approved manufacture and bearing the SANS mark.

The arrestors or diverters shall be mounted inside the panel on the incoming unit. The supply side connections shall be made in the factory to the three phase busbars, whilst the earth side connections shall be made to the earth bar of the board.

All 4-20 mA loops are to be electrically isolated from the PLC analogue input by means of an isolator unit or splitter unit.

All loops entering the panel from the field must be protected by means of surge protection units. With circuit breaker protection, equal or approved. All surge protection units are to be bonded to earth by means of 4mm² multi strand earth cable.

GS.1.24 SPARE FUSE CARTRIDGES

Where HRC or other cartridge types fuses are specified or used to protect instruments or circuits, the MCC shall be suitably equipped with a compartment for housing one third of all fuse cartridges specified, having a minimum of 1 set (i.e. 3 phase) of fuses of each size specified and all such spare fuses shall be provided inside this compartment on handing over. The compartment shall be clearly labelled: "Spare fuse cartridge": replace used-up fuses.

GS.1.25 LABELS

The requirements of SANS 10142-1 must be complied with.

All boards or panels shall be fully labelled using sandwich type labels, fixed to the board or panel by means of either screws or rivets, or by gluing into metal label holders which are bolted to the board.

Labels should be black lettering on a white background, not less than 6mm in height and mounted centrally below each respective starter unit, in an approved position. A centrally mounted label shall be provided to indicate the manufacturer's details, the design busbar rating and asymmetrical fault level.

A label indicating where the board is "Fed From" shall also be fixed to each MCC.

All relays and wiring terminal blocks inside the MCC shall be labelled to clearly identify the control gear and wiring to equipment.

The cable markings shall indicate the number of cores – core cross sectional area – original of the cable – cable number, of the cable. E.g.

4-35-M-01

2-2.5-M-02

Pump 1 cables

3-10-P1-01

7-1-P1-02

Pump 2 cables

3-10-P2-01

7-1-P2-02

Pump 3 cables

3-10-P3-01

7-1-P3-02

GS.1.26 WORK TESTS

The MCC shall be fully assembled and wired before being dispatched from the works. The Contractor and the switchboard manufacturer will carry out a full functional test to prove the correct operation of the entire MCC, including interlocking, remote control and the simulation of all protection devices. All other circuits external to the switchboard will be simulated and will be tested accordingly.

All MCC's with a fault level of 10kA or more shall be type tested by an accredited person and a signed certificate issued with the MC., The costs of all these tests shall be borne by the contractor. The tests shall be witnessed by the Employer's Representative.

Unless otherwise specified, the correct function of the PLC hardware will not be the responsibility of the MCC manufacturer, but the contractor will be expected to have an artisan standing by during tests in order to observe the MCC operations and carry out any remedial work required.

The tests shall be witnessed by the Employer's Representative and shall be recorded in triplicate on approved test forms.

GS 1.27 SOFT STARTER**Conformity of standards****EC**

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

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°C with de-rating of maximum 0.8% per °C above 40°C

- 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

GS1.28 VARIABLE SPEED DRIVES**1. General**

This part of the specification describes the general requirements for the Variable Speed Drives, the VSDs. The nominal values, the standard documents and the drive's minimum performance are defined in this part. The VSD does not include motor in this specification. The specification uses the term Motor unit which means a combination of the VSD and the motor.

If the project-specific part of the specification (Appendix A) is in contradiction with the other parts of the document, the project-specific document shall apply.

2. Requirements for the Manufacturer**2.1 Certifications**

The Frequency Converter Manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system.

The Manufacturer shall have the Environment Certification ISO 14001.

2.2 Experience

The Manufacturer shall have adequate experience in frequency converter manufacturing and have adequate business volume in order to provide credibility in his commitments and a capability of long term support. The Manufacturer shall prove his experience by quoting references of units in the specified power and voltage range.

2.3 Local support

The Supplier shall have a permanent representative office with a trained and skilled support staff, in the country where the goods are delivered, in order to prove his commitment for local support and to provide a channel for communication. The local representatives shall be easily accessible and shall be able to arrive at the site within 24 to 48 hours' notice.

The Engineers employed by the Supplier's regional office shall be certified by the Manufacturer and provide start-up service including physical inspection of the drive, connected wiring and final adjustments, to ensure that the VSD meets the required performance.

The Supplier shall be able to give basic drives training to the Customer's engineers, preferably on the site but anyway, in the country where the customer's site is. The training shall, as a minimum, include system concepts and basic troubleshooting. The Supplier shall also be capable of solving most VSD problems quickly. He shall also have a 24-hour support from the Drives Factory, to avoid any delays during service or repair work on the site.

The Manufacturer shall be able to offer commissioning of the drive to be done by the local office. The most common spare parts like fuses, IGBTs as well as main control- and IO-boards shall be available in 48 hours from the notification through a regional service center of the Supplier. The more rarely used spare parts should be available in maximum 5 days on site!

3. Basic requirements for the VSDs

3.1 General requirements

The VSD shall be of the most modern design, yet user friendly and be simple to install, commission and maintain. The VSD shall be able to start and control the speed of a standard squirrel cage induction AC motor. The VSDs shall be CE marked. The VSDs have to be built to comply with the IEC standards. In the Australian market the VSDs shall have a C-tick.

The materials used in the VSD shall be recyclable, non-toxic and flame retardant.

The VSD shall be a digitally controlled drive, using, at least, the Pulse Width Modulation (PWM) with flux vector control, a Direct Torque Control (DTC), or equivalent. It shall have IGBT's in the

inverter section of the throughout the power range, and it shall have the following minimum specifications.

Operating conditions:

Rated Input Voltage	:	380V - 415V, three-phase, + 10 or
	:	380V – 500V, three-phase, + 10 or
	:	525V – 690V, three-phase, - 10%, +
5%		
Rated Input Frequency	:	48 - 63Hz
Fundamental Power Factor	:	0.97 or better at nominal load
Efficiency	:	³ 98 % at nominal load
Output Voltage	:	0 - UN, three-phase
Output Frequency Range	:	0 to 300 Hz, adjustable
Output Frequency Resolution	:	0.01 Hz
Accel/Decelerate Time	:	0 – 1800 s, adjustable
Overloadability (by load type)	:	
Constant Torque	:	150% of nominal current for 1min in
every 5 mins.		
Variable Torque (pump & fan)	:	No overloadability required
Ambient Temperature	:	40 °C, for higher temperatures see below
Installation Altitude	:	1000 m, for higher altitudes see below
Max. Relative Humidity	:	95%, non-condensing. In presence of
corrosive		
		gases, the max. relative humidity is 60 %
Max. Corrosion Level of the Cooling Air	:	
Chemical Gases	:	IEC 721-3-3, class 3C2
Solid Particles	:	IEC 721-3-3, class 3S2
Max. Vibration Level (IEC 68-2-6):		
2 to 9 Hz	:	0.3 mm
9 to 200 Hz	:	1 m/s ²
Main Protections	:	Overcurrent, short circuit, input/output
phase loss,		
		motor overload and underload,
		over/under-voltage, overspeed, over-
		temperature, motor stall, other internal
		fault.

The VSD shall be able to give a 100 % output current continuously in the above specified conditions. In order to ensure that the drive can provide the required output current in the specified ambient conditions, the Manufacturer shall inform the required derating, if the ambient temperature given in the project-specific specification is higher than 40 °C or if the installation altitude is more than 1000 m above the sea level. The derating factor shall be specified so that neither the lifetime of the VSD nor the unit's performance, overloadability included, nor the reliability of the VSD shall suffer.

Storage conditions (in the protective package):

Ambient Temperature	:	- 40 to +70°C
Corrosion Level of the Cooling Air	:	
Chemical Gases	:	IEC 721-3-3, class 1C2
Solid Particles	:	IEC 721-3-3, class 1S3
Max. Vibration Level (IEC 68-2-6)	:	

2 to 9 Hz	:	1.5 mm
9 to 200 Hz	:	5 m/s2
Shock (IEC 68-2-29)	:	max. 100 m/ s2, 11 ms
Free fall	:	250 mm for weight under 100 kg 100 mm for weight over 100 kg

3.2 VSD Accuracy

The VSD shall have a minimum speed control accuracy of $\pm 10\%$ of the nominal slip of the motor, without a pulse encoder feedback. In practice, this means e.g. for a four-pole, 50 Hz motor with a 45 rpm slip speed, an accuracy of $\pm 0.3\%$ of the motor nominal speed. The VSD shall be capable of a dynamic accuracy of at least 0.4% sec. without additional options. If this accuracy is not achieved without a speed feedback, the Manufacturer shall specify the accuracy that can be reached and if required, a pulse encoder with adequate control devices shall be included in the motor unit at the VSD Supplier's expense. The dynamic accuracy means the drive's capability to response fast in a dynamic situation, for example, if the load changes. It is measured by the change of speed and time, i.e. how long it takes to recover to the reference speed.

3.3 Starting torque and torque step rise time

Constant torque applications: The Starting Torque of the Motor unit without a pulse encoder feedback shall be at least 150 % of the rated Motor unit torque.

Variable torque applications: The Starting Torque of the Motor unit without a pulse encoder feedback shall be at least 100 % of the rated Motor unit torque

In case of need of fast torque rise time, the torque step rise time from 10 % to 90 % of the full nominal torque should be less than 5 m/s, when the motor is fully magnetized. If the motor mechanical time constants are longer than that, the torque step rise time should be according to mechanical time constant.

3.4 Quality assurance and warranty

Every VSD has to be tested functionally. The inverter part of the VSD or each inverter module at least has to be tested by running it with a motor at full nominal load. A test report of the tests made has to be included with the VSD.

The warranty period of the VSD has to be a minimum of 24 months from the date of delivery or 12 months from the date of commissioning, whichever comes first.

4. Enclosure and mounting

The VSDs up to 75 kW in 400 V and 690 V or 90 kW in 500 V, can be installed separately in drive modules. There should be a possibility for flange mounting, to provide for cases, when the drive is installed in a cabinet and to enable installation of the heatsink outside the cabinet.

The VSD shall be equipped with fuses and a main circuit switch must be available either as standard or, at least, as an option. The switch shall be equipped with a door interlocked handle, padlockable in the open position. Input fuses shall be of semiconductor type, and their characteristics coordinated with the drive's electronic protection circuits so that they do not blow from normal output faults such as an overcurrent fault. The Control Panel of the VSD shall be accessible for programming and controls with the main door closed. The whole assembly shall be implemented with a strict consideration of the EMC Compatibility and Regulations as described further in this specification.

Panel Design Specs:

- Standards : IEC 439-1, EN 60439 & VDE660 Part 500.
- Protection Class : IP21 or better
- Cabinet access : From front
- Cable entry and exit : Bottom entry as standard. Both bottom and top entry have to be possible.

5. User interface

5.1 General

The user interface shall be similar throughout the power range to avoid confusion amongst the user's and need for training in several different units.

5.2 Inputs and outputs

The following standard Inputs and Outputs at least shall be provided, to be used in interface with the control system:

- Analogue Inputs : 1 x Programmable differential voltage input 0(2) - 10V
2 x Programmable differential current input 0(4) - 20mA
- Analogue Outputs : 2 x Programmable current outputs 0(4) - 20mA
- Digital Inputs : 6 x Programmable Digital Inputs, opto-isolated, common or separate ground
- Relay Outputs : 3 x Programmable Digital outputs with a changeover dry contact

All the control terminals shall be clearly marked.

The following functions at least shall be available via the IOs:

Input	Output
Analogue	Analogue
Speed reference	Motor speed
Torque reference	Motor torque
PID-control feedback (actual value)	Motor current

Correction signal to reference	Outputfrequency
	Output voltage
	Output of the process PID controller
	Control deviation of the PID controller
	Actual value of the PID controller
	Process speed

Digital	Relay
Start	Fault
Stop	Running
Forward/reverse	Ready
Pre-programmed constant speeds	Rotation direction
Speed up / down (motor potentiometer)	Fault/warning
Start and stop from 2nd source	Warning
Selection of acceleration / deceleration ramp	Stall fault or warning
Selection of user macro	VSD temperature fault or warning
Run enable	Motor temperature fault or warning
Selection of control place	Speed or torque limit reached
Fault reset	Motor magnetized
	Controlled via serial communications

5.3 Serial communications

The VSD shall as standard have a provision for communication with PC software tools. In addition, the following serial communication protocols at least shall be available as option: Modbus, Modbus+, Interbus-S, Profibus DP, LONWORKS and DeviceNet. It shall be possible to add the serial communication later.

5.4 VSD keypad

The VSD shall have a detachable keypad with alphanumeric operating display for programming and controlling purposes. The displayed messages shall be in user friendly, descriptive text. Coded messages are not acceptable. Parameter setting shall be possible by using the keypad. Parameter setting shall be easily accessible and user friendly with actual text messages. Password protection shall be provided to avoid unauthorized tampering with the set parameters. It shall be possible to read and write the set parameters with the help of the control pad, enabling thus copying of parameters between the VSDs of a similar application, to save time during the commissioning and to avoid mistakes. The VSD shall have a local lockout to prevent accidental transfer from remote to local.

Direct keypad entry shall be provided to observe the following actual parameters. Any three of the following parameters or actual values shall be selected to be always displayed.

- Input Voltage
- Input Frequency
- Output Voltage
- Output Frequency
- DC Bus Voltage
- Output Power
- Output Torque
- Output Current
- Motor Speed
- Process Speed

The following parameters shall always be displayed during normal operation.

- Speed Reference
- Run / Stop / Fault
- Remote / Local

The VSD shall have self-diagnostic properties to display faults and warnings as they occur and be able to store at least 15 previous faults into the fault memory. The fault memory shall be accessible by PC maintenance tools.

The following drive control functions at least shall be available from the keypad:

- Run
- Stop
- Local / Remote selection.
- Forward/Reverse (if function enabled)
- Accelerate (manual/mode)
- Decelerate (manual/mode)
- Parameter setting
- Scrolling & Viewing through Actual values

5.5 Application programming

The VSD shall be designed for both simple and the most complicated applications, yet it shall be user friendly. The VSD shall have built-in application macros, to allow selection of the range of pre-programmed control configurations and further, the VSD shall enable storing of two customer modified macros at least, to suit the specific application. It shall be possible to reset the parameter settings back to the original macro settings through the keypad. The parameter readouts shall be in text format and not coded.

5.6 PC Tools

The VSD Supplier shall have a Windows based PC software available for monitoring and controlling the VSDs, and the software shall be offered as an option. The software shall be supplied with the necessary hardware and a provision for connecting a PC with the VSD. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software.

6. Software features

6.1 Power loss ride-through

The drive shall have a power loss ride-through capability. This means that the drive controls should stay alive during a power loss by means of the energy stored in the load. The ride through time shall be the longer the higher the kinetic energy of the load is. The motor shall be magnetized as long as there is kinetic energy in the system.

6.2 Flying start

The drive shall have a built-in Flying Start feature. This feature will allow a Motor unit which is still rotating, to be restarted without first stopping it. The VSD shall restart the motor from the rotating speed and then reaccelerate to the speed indicated by the speed reference signal. The Flying Start feature shall be available in both directions, to be able to start the drive in the required direction regardless of the rotation direction of the motor.

6.3 Flux Optimisation

The VSD shall have a built-in automatic Flux Optimization function. The Flux Optimization function minimizes the sum of the magnetizing current and the load current so that the drive can still follow the given reference. This feature reduces energy consumption and motor noise when driving at less than the nominal load.

6.4 Flux braking

There shall be a possibility for Flux Braking, where VSD increases the motor magnetization to dissipate the extra energy in case of need for small braking power. It shall be possible to use the braking to decelerate the motor from one speed to another – not only for stopping the motor.

6.5 Critical speed jump-over

The VSD shall have programmable skip speeds to jump over critical resonance speeds. If the speed reference is in the critical speed area, it is ignored and the latest speed reference is maintained. Three programmable critical speeds at least shall be available.

6.6 Current/speed limiting

In case the acceleration or deceleration ramps are too fast for the drive capacity, the drive shall be able to automatically reduce the ramp to prevent tripping. Also, in case of transient overloads the drive shall automatically reduce speed to prevent an overcurrent trip, if the drive capacity is not sufficient to handle the load.

6.7 PID-controller

The drive shall have a built-in PID-controller for control of the customer process.

6.8 Restart

In the event of a fault trip due to overvoltage, overcurrent or loss of analogue signal, the VSD shall be programmable to attempt an automatic restart. For safety reasons, the maximum number of attempts shall be five (selectable) within a short time. If the fault does not clear after the attempts, the drive shall lock out.

7. Environmental effects

7.1 Harmonic Distortion

The VSD shall have built-in AC or DC chokes to minimize the Total Harmonic Distortion (THD). The THD of the unit for current has to be less than 50% in a supply network with a short circuit ratio (SCR) of 300 (i.e. the ratio of the supply network's short circuit current to the unit's nominal current). If the supply voltage is 440 V or higher, the THD value has to be less than 55%. However, the VSD Manufacturer shall submit to the contractor the VSD Harmonic spectrum for the project-specific supply network. The spectrum shall be used in the design of appropriate harmonic filters, if required by the Customer. The single harmonics shall be presented up to 25th harmonic and the THD has to be calculated taking into consideration harmonics up to 40th harmonic.

7.2 EMC Regulations and Compatibility / C-Tick

The supplied VSDs shall carry the CE mark (or C-Tick in Australia) indicating that they comply with the essential requirements of the relevant EU directives (or C-Tick requirements in Australia). The VSDs shall meet the requirements set in EN 61800-3 for Industrial Low-Voltage Networks. If the project-specific specification states that the requirements for Public Low-Voltage Networks stated in EN 61800-3 must be met, the Supplier shall be able to provide such units at least up to 75kW in earthed networks. If separate EMC filters are required, they shall be of built-in type.

A detailed description and other directions to maintain the EMC Compatibility during the installation of the VSD and associated field cables and connections, shall be given by the Supplier

in conformance with the EMC Directives or C-Tick. The Contractor shall follow the directions during installation, in order to achieve attenuation of the RFI.

7.3 Audible Noise

The full load audible noise of the frequency converter shall not exceed 70 dB(A) in 200kW applications and below. Above 200 kW, the full load audible noise shall not exceed 78 dB(A). If the frequency converter is installed in a cabinet and requires a separate cooling fan, these limits also include the noise of the additional cooling fan. This requirement is made to keep the electrical room quiet so that it is not necessary to use hearing protection. The audible noise of the motor should also be minimized. For that purpose the switching frequency of the frequency converter shall be at least 2 kHz throughout the power range.

7.4 Efficiency

The full load efficiency of the VSD shall be at least 98 % including all the additional equipment which is needed to meet this specification.

GS.1.29 SITE TESTS

After completion of erection, cabling and field wiring, the contractor shall set all overloads, protection devices etc. and shall again carry out a full functional test to prove the correct operation of the entire MCC, including the simulation of all remote devices. A signed compliance certificate by the Contractor's accredited person for the MCC and its installation shall be handed over to the Employer's Representative on Completion.

The tests shall be witnessed by the Employer's Representative and shall be recorded in triplicate on approved test forms.

GS.1.30 INSTALLATION OF MOTOR CONTROL CENTRES

The contractor shall make it his responsibility to furnish the switchboard manufacturer with all the relevant information in respect of the accommodation to be provided, including cable trenches and ducts etc.

Where possible, the largest number of cubicles or panels should be installed intact, to avoid assembly on site, provided space and handling facilities and conditions do not lead to damage of the unit.

The contractor will advise the manufacturer which of the cables enter or leave from the top or bottom of the MCC.

GS.1.31 DRAWINGS, EMPLOYER'S REPRESENTATIVE'S APPROVAL, GUARANTEES

CAD generated drawings of the equipment showing full details of layout and proposed wiring system and equipment offered shall be submitted for approval to the Employer or his Representative prior to manufacture. The drawing must include part numbers and manufacturer's of all plant and equipment.

The Employer's Representative shall also be advised when the board are being manufactured and when they will be ready for inspection at the works, Equipment which is des-patched to the site without the authorization of the Employer or his Representative may be rejected and all costs incurred in having it returned to the factory, where necessary, and any liability for delays, will be for the contractor's account.

The contractor will issue to the Employer's Representative one set of sepias and 3 copies of drawings of the "As Built" equipment which has been installed and connected on site after the draft copy has been approved. Handbooks, spares lists and maintenance instructions etc. will be issued to the Employer's Representative in triplicate at the time of handing over the equipment before the guarantees period commences.

The manuals shall be comprehensive and to include all equipment supplied. A 12 month guarantee shall cover the sheet metal enclosures and all the equipment installed therein against fault workmanship and materials. The guarantee period shall begin from the date the MCC's are completely installed and accepted by the Employer's Representative. Fair wear and tear of equipment will be excluded from the guarantee.

GS.1.32 COMPLETION

Prior to the handing over of the boards or panels and the associated electrical installation, they shall be rendered completely free of all dust or rubbish that may have collected during installation and building operations, and finished surfaces shall be made good where necessary, using the identical paint finishes from the same batch, as at the time of manufacture.

The MCC's shall be vermin proofed. Similarly, all cable trenches will be thoroughly cleaned out and all covers fitted before the work will be considered as complete. All labels will be correctly engraved and fixed to panels and cables as specified before the work can be considered complete.

All cable sleeve or other openings shall be closed or patched up and made good: Cable sleeves shall be sealed using an approved expanding foam sealer and neatly trimmed.

GS.1.33 SUGGESTED SUPPLIERS

Refer to the PROJECT SPECIFICATION

GS.1.34 MANUFACTURERS

Manufacturers may be considered by the Employer's Representative, but only if they have a proven track record of manufacture to SANS 1473/SANS 60439.

The tenderer shall ensure that copies of these Standard Specifications, Detailed Specifications, layout drawings and single line diagrams if available shall be provided to the manufacturer's to ensure that they make full allowance for all requirements in their pricing.

GS.1.35 PLC SPECIFICATION

GS.1.35.1 PLC HARDWARE

All PLC hardware that would be required to meet the I/O and philosophy requirements. Architecture and Bill of Materials provided as reference. When specified in the tender document, provision shall be made for mounting the PLC hardware in the motor control centre. All PLC components will be supplied by the contractor. Details of the equipment to be installed and the required arrangement of such equipment will be included in the tender document. In general, the manufacturer shall allow 1 or more compartments or tiers in the MCC for rack assemblies which shall accommodate ONLY the PLC hardware, including the input and output modules. Where special power supplies such as a CVT, UPS or DC supplies are specified, these shall be regarded as part of the hardware and shall be mounted in the same compartment as the other equipment. The power circuit

drawings and the control schematics relating to each MCC will include all connections to the PLC hardware. All such connections shall be made by the MCC manufacturer via the marshalling compartment. In addition to the general power earth bar specified elsewhere, an "Instrument Earth 0 Volt Bar" and an "Instrument Screen Earth Bar" shall be provided in each compartment housing PLC Hardware and these shall be used only for instrumentation earthing connections. They shall be electrically isolated from the power earth. Particular attention shall be paid to the provision of cabling facilities to the modules. Adequate PVC cable trunking shall be installed and separate trunking shall be provided for analogue and digital circuits. Wiring to and from analogue input and output modules shall be carried out using cables equal to Contronics DEKORON control cable Type 1751, with 0.5mm² conductors. Each analogue control cable shall be individually earthed to the instrument earth bar by means of its tinned copper drain wire AT ONE END ONLY. The wiring between each starter panel and the digital input and output modules in the PLC panel shall be as indicated on the circuit diagrams and shall be installed in adequately sized PVC trunking with provision for 50% spare capacity. With the exception of the PLC output to the starter or relay coil, no power circuits may be run in this PVC trunking. Each end of each core shall be terminated in a spade or pin type pre-insulated lug and marked with its respective wire number by means of interlocking plastic ferrules as detailed in the circuit diagram or termination schedule. Where connections are to be made between the PLC I/O modules and field cabling, the MCC manufacturer shall wire the I/O module terminal to the marshalling compartment.

The PLC shall be coded using IEC-61131-3 standards.(Ladder Logic) or other approved standard.

GS.1.35.2 STRUCTURE

All Tags should follow a detailed I/O list and conform to a standard structure in naming conventions. All Networks are to be commented and defined. Tag naming conventions to be defined and documented.

GS.1.35.3 KNOWLEDGE TRANSFER

The PLC programmer should ensure Knowledge transfer in terms of PLC Programming. This should be done at the PLC programmers office and the Program should be clearly defined in terms of structure and method.

GS.1.35.3 CERTIFICATIONS

Must be a Recognized Certified DELTA or Allen Bradley System or as approved by the Client and Engineer.

GS.1.35.4 TRAINING

Training - The contractor should provision for Training for the Client's operations and maintenance staff members as per provisions as specified in the BOQ.

GS.1.35.5 LICENCES

Licenses - The contractor should make provision for 2 of Mini Licenses or Licenses to suit his software and program or equivalent.

GS.1.35.6 TYPE

PLC Type – Delta or CompactLogix or similar and equal approved. Delta preferred.

GS.1.35.7 CONFIGURATION

Software Blocks: A modular software design shall be adopted. Standard software blocks shall be used for common control equipment such as motors, valves, actuators, measured values, alarms, totalizers, sequence and closed loop controllers.

GS.1.35.7 INTEGRATION

The PLC will need to integrate with the RTU by means of the Modbus RTU protocol over RS 485. The PLC shall act as the Modbus Slave. Where there are VSD's or Soft starters, then the PLC would integrate by means of Ethernet IP. Where there are Universal Motor Controllers, the PLC would integrate by means of Ethernet IP.

GS.1.35.8 CONTRACTUAL

Existing Code and Documentation- In certain instances the Client or Water Services Authority may provide existing code/s and QC documentation for re-use, therefore all aspects relating to the PLC coding and quality control should be priced but noted as an option, as only partial services may be utilized. A provisional sum should also be included to cater for instances where the PLC System Integrator/Engineer's services are required for technical assistance and/or for commissioning purposes.

GS.1.35.9 PLC QUALITY CONTROL

The Contractor shall prepare and submit (Hard and Soft copy) for approval, a Functional Design Specification explaining how the PLC software will be implemented and how the required control philosophy will be programmed. The Functional Design Specification shall include the following as a minimum: (A sample shall be provided by the contractor)

1. Software structural breakdown and description
2. Equipment modes of operation description
3. Tag numbering system (equipment and software)

-
4. Complete device list (sensors, actuators etc.)
 5. Complete input and output list with physical addresses
 6. Logic diagrams for control of all devices
 7. Complete list of all alarms generated within the PLC
 8. Equipment start-up and shutdown sequences (including flow charts)
 9. List of registers and timers with default settings
 10. Complete data communications structure with tags (for HMI and/or SCADA systems)

The FDS shall be approved by the Engineer prior to bulk software configuration.

GS.1.35.10 INSPECTIONS

The minimum inspection of the PLC, by the Engineer, shall include the following:

- Correct choice of PLC CPU and power supply (calculations to be submitted)
- Correct configuration of all Input and Output Cards (drawings to be presented)
- Correct wiring of all expansion/ remote modules (drawings)
- Correct wiring of all input and outputs to marshalling strips (drawings)
- Code review of all PLC Control Logic (logic diagrams, flowcharts and software printouts to be presented)
- Review of the Contractor's Quality Control Documentation (check-lists to be presented)

GS.1.35.11 TESTING

The minimum testing of the PLC system, by the Client and Engineer, shall include the following:

1. Thin slice testing and acceptance of all software control blocks
2. Correct operation of all control logic
3. Correct operation of all modes of operation
4. Correct detection and annunciation of simulated faults
5. Correct inter PLC/ RTU data communication
6. PLC cycle time measurement

The compulsory method of testing shall be using the actual PLC that will be delivered to site and be simulated within the same MCC.

The Contractor shall carry out a full functional test to prove the correct operation of the PLC Program, including interlocking, remote control and the simulation of all protection devices. All other circuits external to the PLC shall be simulated and shall be tested accordingly. No PLC code manipulation shall be utilized to achieve the simulations.

The proposed testing procedure shall be documented by the Contractor and approved by the Client and Engineer before testing takes place. The tests shall be witnessed by the Employer's Representative and shall be recorded in triplicate on an approved test form before shipment to site.

GS.1.35.12 DOCUMENTATION

The following documentation shall be provided by the Contractor at the various project phases listed below: (Hard and Soft copy)

A) DURING CONSTRUCTION

Control system architecture drawing

- PLC I/O list
- PLC loading calculations
- PLC panel General Arrangement drawing
- PLC panel schematic/wiring drawings
- PLC Functional Design Specification (FDS)
- Point to point wiring check certificates
- PLC panel IP certificate
- PLC panel Quality Control Documentation certificates
- PLC panel Certificate of Compliance and test report

B) AS BUILTS

Control system architecture drawing

- PLC I/O list
- PLC loading calculations
- PLC panel General Arrangement drawing
- PLC panel schematic/wiring drawings
- PLC I/O loop drawings
- PLC Functional Design Specification (FDS)
- PLC Trip and Alarm Matrix
- PLC Control Logic (logic diagrams, flowcharts and software)

GS.1.35.13 HMI QUALITY CONTROL

The HMI shall be inspected by the Engineer and tested by the Contractor (which tests shall be witnessed by the Engineer) prior to delivery, installation and switch-on at site.

GS.1.35.14 INSPECTIONS

The minimum inspection of the HMI, by the Engineer and Contractor, shall include the following:

1. Correct choice of HMI and power supply

2. Correct configuration of all HMI graphics, alarms and trend pages (drawings to be presented)
3. Correct wiring (drawings)
4. Review of the Contractor's Quality Control Documentation (check-lists to be presented).

GS.1.35.15 TESTS

The minimum testing of the HMI system, by the Engineer and Contractor, shall include the following:

1. Correct operation of equipment
2. Correct operation of all modes of operation
3. Correct graphics, alarm and trend operation
4. Correct inter PLC/ SCADA data communication
5. PLC cycle time measurement with HMI connected
6. PLC/ SCADA data communications response time measurement
7. Correct trends setup
8. Correct alarms setup
9. Correct user access level setup

GS.1.35.16 DOCUMENTATION

This following documentation shall be provided by the Contractor at the various project phases listed below:

A) DURING CONSTRUCTION

- Control system architecture drawing
- HMI panel General Arrangement drawing
- HMI panel schematic/wiring drawings
- Functional Design Specification (FDS)
- Point to Point wiring check certificates
- HMI panel IP certificate
- HMI panel Quality Control Documentation certificates
- HMI panel Certificate of Compliance and test report

B)

- Control system architecture drawing
- HMI panel schematic/wiring drawings
- Functional Design Specification (FDS)
- Point to point wiring check certificates
- HMI panel IP certificate
- HMI panel Quality Control Documentation certificates

- HMI panel Certificate of Compliance and test report

GS.1.35.17 TYPICAL HARDWARE LIST**PLC Hardware**

The below list of hardware is current a typical installation within the PLC cubicle of the MCC; or similar and equal approved:

Item	Description	Tag Name to (Ref. DWG)	Supplier	Part Number	Quantities
1	PLC Controller	L16ER	Rockwell	1769-L16ER-BB1B	1
2	Digital Input Module	IB8-1/2	Rockwell	1734-IB8	2
3	Base Unit (for above)	IB8-1/2	Rockwell	1734-TOP	2
4	HMI Display Unit	HMI	Rockwell	2711P-T7C21D8S	1
5	Ethernet Switch	ETH01	Rockwell	1783-US5T	1
6	Modbus Serial Module	MB-485	Prosoft	ILX34-MB485	1
7	Power Monitor	PM500	Rockwell	PM500-ETHER-NET	1
8	Wireless Router	WIFI	D-Link	N150	1

GS.1.35.18 TYPICAL I/O LIST**Input and Output Schedule**

Digital Input Signals :

TAG NAME	DESCRIPTION	PLC TAG NAME	PHYSICAL INPUT
XX_MIC_001_AUTO	Pump No. 1 - Auto	Local:1:I.Data.0	Module:1.0
XX_MIC_001_HAND	Pump No. 1 - Hand	Local:1:I.Data.1	Module:1.1
XX_MIC_001_RUN	Pump No. 1 - Run	Local:1:I.Data.2	Module:1.2
XX_MIC_001_OLOAD	Pump No. 1 - Overload Trip	Local:1:I.Data.3	Module:1.3
XX_MIC_001_ELF	Pump No. 1 - Earth Fault Trip	Local:1:I.Data.4	Module:1.4
XX_MIC_001_CURRENT	Pump No. 1 - Under Current Trip	Local:1:I.Data.5	Module:1.5
XX_MIC_001_SPARE_01	Pump No. 1 - Spare	Local:1:I.Data.6	Module:1.6
XX_MIC_001_SPARE_02	Pump No. 1 - Spare	Local:1:I.Data.7	Module:1.7
XX_MIC_002_AUTO	Pump No. 2 - Auto	Local:1:I.Data.8	Module:1.8
XX_MIC_002_HAND	Pump No. 2 - Hand	Local:1:I.Data.9	Module:1.9
XX_MIC_002_RUN	Pump No. 2 - Run	Local:1:I.Data.10	Module:1.10
XX_MIC_002_OLOAD	Pump No. 2 - Overload Trip	Local:1:I.Data.11	Module:1.11
XX_MIC_002_ELF	Pump No. 2 - Earth Fault Trip	Local:1:I.Data.12	Module:1.12
XX_MIC_002_CURRENT	Pump No. 2 - Under Current Trip	Local:1:I.Data.13	Module:1.13
XX_MIC_002_SPARE_01	Pump No. 2 - Spare	Local:1:I.Data.14	Module:1.14
XX_MIC_002_SPARE_02	Pump No. 2 - Spare	Local:1:I.Data.15	Module:1.15
XX_MIC_003_SPARE_01	Pump No. 3 - Spare	Local:2:I.Data.0	Module:2.0
XX_MIC_003_SPARE_02	Pump No. 3 - Spare	Local:2:I.Data.1	Module:2.1
XX_MIC_003_SPARE_03	Pump No. 3 - Spare	Local:2:I.Data.2	Module:2.2
XX_MIC_003_SPARE_04	Pump No. 3 - Spare	Local:2:I.Data.3	Module:2.3
XX_MIC_003_SPARE_05	Pump No. 3 - Spare	Local:2:I.Data.4	Module:2.4
XX_MIC_003_SPARE_06	Pump No. 3 - Spare	Local:2:I.Data.5	Module:2.5
XX_MIC_003_SPARE_07	Pump No. 3 - Spare	Local:2:I.Data.6	Module:2.6
XX_MIC_003_SPARE_08	Pump No. 3 - Spare	Local:2:I.Data.7	Module:2.7
XX_GNRL_FF	General – Fuse Fail	Local:3:I.Data.0	Module:3.0
XX_GNRL_LS_A	General – Reservoir “A” Low Level	Local:3:I.Data.1	Module:3.1
XX_GNRL_LS_B	General – Reservoir “B” Low Level	Local:3:I.Data.2	Module:3.2

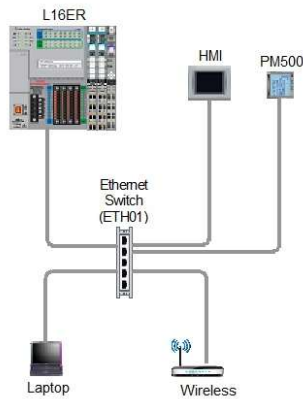
XX_GNRL_INT_AL	General – Intruder Alarm	Local:3:I.Data.3	Module:3.3
XX_GNRL_FIRE_AL	General – Fire Alarm	Local:3:I.Data.4	Module:3.4
XX_GNRL_NFS_001	General – No Flow Pump No. 1	Local:3:I.Data.5	Module:3.5
XX_GNRL_NFS_002	General – No Flow Pump No. 2	Local:3:I.Data.6	Module:3.6
XX_GNRL_PLC_ZS	General – PLC & UPS Limit Switch	Local:3:I.Data.7	Module:3.7

Digital Output Signals :

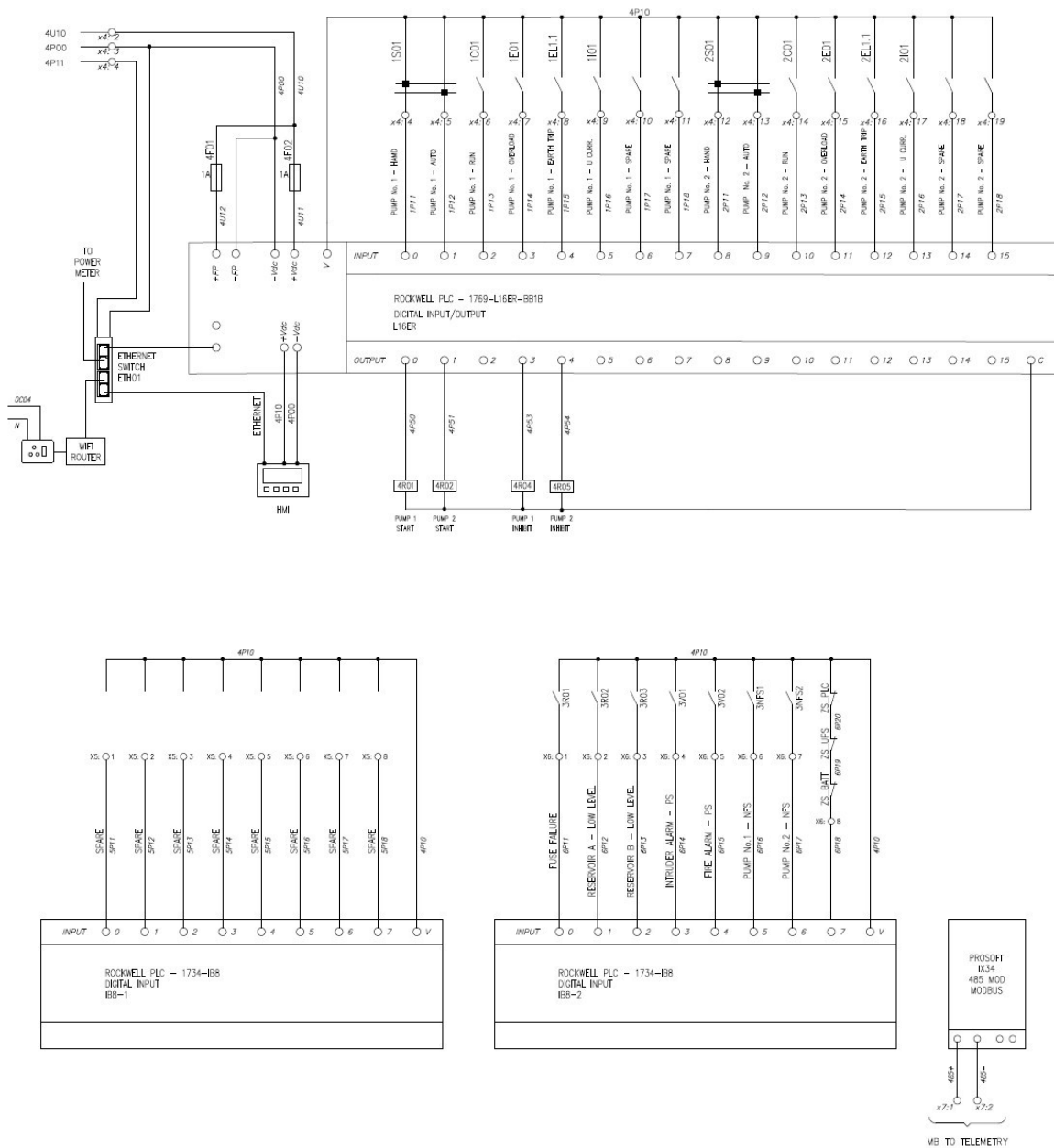
TAG NAME	DESCRIPTION	PLC TAG NAME	PHYSICAL OUTPUT
XX_MIC_001_CMD	Pump No. 1 – Start	Local:1:O.Data.0	Module:1.0
XX_MIC_002_CMD	Pump No. 2 – Start	Local:1:O.Data.1	Module:1.1
XX_MIC_003_SPARE	Pump No. 3 – Spare	Local:1:O.Data.2	Module:1.2
XX_MIC_001_INHIBIT	Pump No. 1 – Inhibit	Local:1:O.Data.3	Module:1.3
XX_MIC_002_INHIBIT	Pump No. 2 – Inhibit	Local:1:O.Data.4	Module:1.4
XX_MIC_003_INHIBIT	Pump No. 3 – Spare	Local:1:O.Data.5	Module:1.5

GS.1.35.19 TYPICAL NETWORK LAYOUT

Location	Location and Label	Colour
Ethernet Switch	Power Meter	White
Ethernet Switch	HMI	Red
Ethernet Switch	PLC	Green
Ethernet Switch	D Link	Blue



PS.1.35.20 TYPICAL WIRING DIAGRAM



GS.1.35.21

TYPICAL COMPLETE I/O INCLUDING TELEMETRY

Tag Name	Description	PLC Address	Gateway Address	Telemetry Address	PLC	HMI	TELE	SCADA	Comments
Status to Telemetry System									
Digital Signals									
P1_HAND	Pump No. 1- Hand	Local:1:Data.0	MBS DATA OutputRegister[0]	DIN1	x	x	x	x	
P1_AUTO	Pump No. 1- Auto	Local:1:Data.1	MBS DATA OutputRegister[1]	DIN2	x	x	x	x	
P1_RUN	Pump No. 1- Run	Local:1:Data.2	MBS DATA OutputRegister[2]	DIN3	x	x	x	x	
P1_OVERLOAD	Pump No. 1- Thermal Trip	Local:1:Data.3	MBS DATA OutputRegister[3]	DIN4	x	x	x	x	
P1_EARTH FAULT	Pump No. 1- Earth Fault Trip	Local:1:Data.4	MBS DATA OutputRegister[4]	DIN5	x	x	x	x	
P1_UNDER CURRENT	Pump No. 1- Under Current Trip	Local:1:Data.5	MBS DATA OutputRegister[5]	DIN6	x	x	x	x	
P1_FTS	Pump No. 1- Fail to Start	EWS_Pump_Sequence.MIC.001.FTS	MBS DATA OutputRegister[6]	DIN7	x	x	x	x	
P1_NOS_ACTIVE	Pump No. 1- Number of Starts Exceeded	AP_MIC_001_RHM.NOS.LMT.ON	MBS DATA OutputRegister[7]	DIN8	x	x	x	x	
P2_HAND	Pump No. 2- Hand	Local:1:Data.8	MBS DATA OutputRegister[9]	DIN11	x	x	x	x	
P2_AUTO	Pump No. 2- Auto	Local:1:Data.9	MBS DATA OutputRegister[10]	DIN12	x	x	x	x	
P2_OVERLOAD	Pump No. 2- Run	Local:1:Data.10	MBS DATA OutputRegister[11]	DIN13	x	x	x	x	
P2_OVERLOAD	Pump No. 2- Thermal Trip	Local:1:Data.11	MBS DATA OutputRegister[13]	DIN14	x	x	x	x	
P2_EARTH FAULT	Pump No. 2- Earth Fault Trip	Local:1:Data.12	MBS DATA OutputRegister[14]	DIN15	x	x	x	x	
P2_UNDER CURRENT	Pump No. 2- Under Current Trip	Local:1:Data.13	MBS DATA OutputRegister[16]	DIN16	x	x	x	x	
P2_FTS	Pump No. 2- Fail to Start	EWS_Pump_Sequence.MIC.002.FTS	MBS DATA OutputRegister[10]	DIN17	x	x	x	x	
P2_NOS_ACTIVE	Pump No. 12- Number of Starts Exceeded	AP_MIC_002_RHM.NOS.LMT.ON	MBS DATA OutputRegister[11]	DIN18	x	x	x	x	
SYS_FF	System - Fuse Failure	Local:3:Data.0	MBS DATA OutputRegister[14]	DIN31	x	x	x	x	
SYS_RES_A_LL	System - Reservoir 'A' Low Level	Local:3:Data.1	MBS DATA OutputRegister[15]	DIN32	x	x	x	x	
SYS_RES_B_LL	System - Reservoir 'B' Low Level	Local:3:Data.2	MBS DATA OutputRegister[10]	DIN33	x	x	x	x	
SYS_INT_AL	System - Intruder Alarm	Local:3:Data.3	MBS DATA OutputRegister[11]	DIN34	x	x	x	x	
SYS_FIRE_AL	System - Fire Alarm	Local:3:Data.4	MBS DATA OutputRegister[12]	DIN35	x	x	x	x	
SYS_P1_NFS	System - Pump No. 1 No Flow	Local:3:Data.5	MBS DATA OutputRegister[13]	DIN36	x	x	x	x	
SPS_P1_NFS	System - Pump No. 2 No Flow	Local:3:Data.6	MBS DATA OutputRegister[14]	DIN37	x	x	x	x	
SYS_BATT_ZS	System - Battery Box Limit	Local:3:Data.7	MBS DATA OutputRegister[15]	DIN38	x	x	x	x	
PM_L1_UV	Power Meter - Under Voltage (Red)	PM500-L1-UV	MBS DATA OutputRegister[18]	DIN41	x	x	x	x	
PM_L1_OV	Power Meter - Over Voltage (Red)	PM500-L1-OV	MBS DATA OutputRegister[19]	DIN42	x	x	x	x	
PM_L2_UV	Power Meter - Under Voltage (White)	PM500-L2-UV	MBS DATA OutputRegister[21]	DIN43	x	x	x	x	
PM_L2_OV	Power Meter - Over Voltage (White)	PM500-L2-OV	MBS DATA OutputRegister[21]	DIN44	x	x	x	x	
PM_L3_UV	Power Meter - Under Voltage (Blue)	PM500-L3-UV	MBS DATA OutputRegister[21]	DIN45	x	x	x	x	
PM_L3_OV	Power Meter - Over Voltage (Blue)	PM500-L3-OV	MBS DATA OutputRegister[21]	DIN46	x	x	x	x	
PM_P_SEQ	Power Meter - Phase Reversal	PM500-P-SEQ	MBS DATA OutputRegister[21]	DIN47	x	x	x	x	
PM_P_FAULT	Power Meter - General Fault	PM500-P-FLT	MBS DATA OutputRegister[21]	DIN48	x	x	x	x	
Analogue Signals									
PM_L12_INT	Power Meter - L1-L2 - Voltage	PM500-L12-INT	MBS DATA OutputRegister[6]	AIN8	x	x	x	x	
PM_L13_INT	Power Meter - L1-L3 - Voltage	PM500-L13-INT	MBS DATA OutputRegister[7]	AIN7	x	x	x	x	
PM_L23_INT	Power Meter - L2-L3 - Voltage	PM500-L23-INT	MBS DATA OutputRegister[8]	AIN8	x	x	x	x	
PM_C1_INT	Power Meter - L1 - Current	PM500-C1-INT	MBS DATA OutputRegister[9]	AIN9	x	x	x	x	
PM_C2_INT	Power Meter - L2 - Current	PM500-C2-INT	MBS DATA OutputRegister[10]	AIN10	x	x	x	x	
PM_C3_INT	Power Meter - L3 - Current	PM500-C3-INT	MBS DATA OutputRegister[11]	AIN11	x	x	x	x	
PM_KWH_INT	Power Meter - KWH Meter	PM500-KWH	MBS DATA OutputRegister[12]	AIN12					
P1_RHM_INT	Pump No. 1- Run Hour Meter	P1_RHM_INT	MBS DATA OutputRegister[13]	AIN13	x	x	x	x	
P1_NOS_INT	Pump No. 1- Number of Starts	P1_NOS_INT	MBS DATA OutputRegister[14]	AIN14	x	x	x	x	
P2_RHM_INT	Pump No. 2- Run Hour Meter	P2_RHM_INT	MBS DATA OutputRegister[15]	AIN15	x	x	x	x	
P2_NOS_INT	Pump No. 2- Number of Starts	P2_NOS_INT	MBS DATA OutputRegister[16]	AIN16	x	x	x	x	
Digital Signals									
AP_TELE_CALL_01	Telemetry Duty Call 1	AP_TELE_CALL_01	MBS DATA InputRegister[26]	DOU17	x	x	x	x	
AP_TELE_CALL_02	Telemetry Duty Call 2	AP_TELE_CALL_02	MBS DATA InputRegister[26]	DOU17	x	x	x	x	
AP_TELE_OR	Telemetry Over-ride ON	AP_TELE_OR	MBS DATA InputRegister[26]	DOU17	x	x	x	x	
AP_TELE_MIC_001_START	Telemetry Pump No. 1 - Start	AP_TELE_MIC_001_START	MBS DATA InputRegister[26]	DOU17	x	x	x	x	
AP_TELE_MIC_002_START	Telemetry Pump No. 2 - Start	AP_TELE_MIC_002_START	MBS DATA InputRegister[26]	DOU17	x	x	x	x	
Analogue Signals									
AP_LIT_001_PV	Elevated Tower Level	AP_LIT_001_PV	MBS DATA InputRegister[27]	AOUT27	x	x	x	x	
AP_LIT_002_PV	Suction Reservoir 'A' - Level	AP_LIT_002_PV	MBS DATA InputRegister[29]	AOUT28	x	x	x	x	
AP_LIT_003_PV	Suction Reservoir 'B' - Level	AP_LIT_003_PV	MBS DATA InputRegister[31]	AOUT29	x	x	x	x	
AP_FIT_001_PV	Inlet Flowmeter - Flow-Rate	AP_FIT_001_PV	MBS DATA InputRegister[33]	AOUT30	x	x	x	x	

C4 SITE INFORMATION

The following locality sketch is included:

Site Locality Plan

The co-ordinates of each pumpstation:

Margate Pumpstation 1

Latitude 30°52'7.01"S;

Longitude 30°22'11.42"E.

Margate Pumpstation 3A

Latitude 30°51'22.01"S;

Longitude 30°22'23.95"E.

Margate Pumpstation 4A

Latitude 30°51'0.71"S;

Longitude 30°21'56.34"E.



C5 ANNEXURES**C5.1 DRAWINGS**

The drawings issued to tenders as part of the tender documents must be regarded as provisional and preliminary for the tenderer's benefit to generally assess the scope of work.

The work shall be carried out in accordance with the latest available revision of the drawings approved for construction

At commencement of the contract, the Engineer shall deliver to the Contractor copies of the AFC 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 defects correction of the works.

All drawings and specifications and copies thereof remain the property of the Employer, and the Contractor shall return all drawings and copies thereof to the Employer at the completion of the contract.

The drawings listed in the table overleaf have been bound into the document.

Tenderers are to ensure that they receive a complete set of the tender drawings and must immediately inform the Engineer of any drawings that are missing so that further copies can be issued.

LIST OF DRAWINGS ISSUED FOR TENDER:

UGU-07-1683-2024 Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 1)		
DRAWING NUMBER	DRAWING DESCRIPTION	REV
V45-02-02-001-LYT-T	LAYOUT OF MARGATE WASTEWATER TREATMENT WORKS	00
V45-02-02-002-LYT-T	MARGATE WASTEWATER TREATMENT WORKS SITE PLAN	00
V45-02-02-003-SLY-T	MARGATE WASTE WATER SCHEMATIC LAYOUT	00
V45-02-02-004-SLY-T	MARGATE WASTE WATER PROPOSED SCHEMATIC LAYOUT	00
V45-02-02-005-DET-T	STANDARD DETIALS	00
V45-02-02-201-IV-T	450mm Ø ISOLATING VALVE CHAMBER DETAILS	00
V45-02-02-202-SV-T	450mm Ø SCOUR VALVE CHAMBER DETAILS	00
V45-02-02-203-AV-T	450mm Ø AIR VALVE CHAMBER DETAILS	00
V45-02-02-204-AV-T	630mm Ø AIR VALVE CHAMBER DETAILS	00
V45-02-02-205-RCD-T	STEEL DETAILS	00
V45-02-02-006-SLY-T	MARGATE WASTE WATER PROPOSED MCC ROOM & MINI SUB	00
V45-02-02-007-SLY-T	MARGATE WASTE WATER PROPOSED SLUDGE RETURN PUMP STATION	00
V45-02-02-008-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 1A	00
V45-02-02-009-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 1	00
V45-02-02-010-SLY-T	MARGATE WASTE WATER EXISTING DIESEL GENERATOR ROOM	00
V45-02-02-011-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 4A	00
V45-02-02-012-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 4A	00
V45-02-02-013-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 3A	00
V45-02-02-206-RCTD-T	ROAD CROSSING DETAIL	00
V45-02-02-207-COLREB-T	COLUMN AND BASE DETAILS DETAILS	00
V45-02-02-208-MDET-T	GABION AND MATTRESS DETA	00
V45-02-02-209-MDET-T	GENERAL DETAILS	00
V45-02-02-210-SB-T	SIGN BOARD	00
V45-02-02-300-LAY-T	PROPOSED NEW SEDIMENTATION TANKS & SLUDGE RE-CIRCULATION PUMPSTATION LAYOUT	00
V45-02-02-301-DET-T	ANNEXURE 8A CURRENT PROCESS FLOW DIAGRAM	00
V45-02-02-302-DET-T	ANNEXURE 8A OPTIMIZED PROCESS FLOW DIAGRAM	00
MAR 001 - E - 001	SITE PLAN - ELECTRICAL DISTRIBUTION AND RETICULATION LAYOUT	00
MAR 001 - E - 002	MARGATE SEWAGE TREATMENT WORKS EXISTING ELECTRICAL DISTRIBUTION AND RETICULATION LAYOUT - SINGLE LINE DIA-GRAM	00
MAR 001 - E - 003	MARGATE SEWAGE TREATMENT WORKS OPTIMISED AND NEW MAIN ELECTRICAL DISTRIBUTION AND RETICULATION LAYOUT SINGLE LINE DIAGRAM	00
V45-02-02-001-LYT-T	LAYOUT OF MARGATE WASTEWATER TREATMENT WORKS	00
V45-02-02-002-LYT-T	MARGATE WASTEWATER TREATMENT WORKS SITE PLAN	00
V45-02-02-003-SLY-T	MARGATE WASTE WATER SCHEMATIC LAYOUT	00
V45-02-02-004-SLY-T	MARGATE WASTE WATER PROPOSED SCHEMATIC LAYOUT	00
V45-02-02-005-DET-T	STANDARD DETIALS	00
V45-02-02-201-IV-T	450mm Ø ISOLATING VALVE CHAMBER DETAILS	00
V45-02-02-202-SV-T	450mm Ø SCOUR VALVE CHAMBER DETAILS	00
V45-02-02-203-AV-T	450mm Ø AIR VALVE CHAMBER DETAILS	00

DRAWING NUMBER	DRAWING DESCRIPTION	REV
V45-02-02-204-AV-T	630mm Ø AIR VALVE CHAMBER DETAILS	00
V45-02-02-205-RCD-T	STEEL DETAILS	00
V45-02-02-006-SLY-T	MARGATE WASTE WATER PROPOSED MCC ROOM & MINI SUB	00
V45-02-02-007-SLY-T	MARGATE WASTE WATER PROPOSED SLUDGE RETURN PUMP STATION	00
V45-02-02-008-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 1A	00
V45-02-02-009-SLY-T	MARGATE WASTE WATER PROPOSED PUMP STATION 1	00
V45-02-02-010-SLY-T	MARGATE WASTE WATER EXISTING DIESEL GENERATOR ROOM	00
V45-02-02-206-RCTD-T	ROAD CROSSING DETAIL	00
V45-02-02-207-COLREB-T	COLUMN AND BASE DETAILS DETAILS	00
V45-02-02-208-MDET-T	GABION AND MATTRESS DETA	00
V45-02-02-209-MDET-T	GENERAL DETAILS	00
V45-02-02-210-SB-T	SIGN BOARD	00
V45-02-02-300-LAY-T	PROPOSED NEW SEDIMENTATION TANKS & SLUDGE RE-CIRCULATION PUMPSTATION LAYOUT	00
V45-02-02-301-DET-T	ANNEXURE 8A CURRENT PROCESS FLOW DIAGRAM	00
V45-02-02-302-DET-T	ANNEXURE 8A OPTIMIZED PROCESS FLOW DIAGRAM	00
MAR 001 - E - 001	SITE PLAN - ELECTRICAL DISTRIBUTION AND RETICULATION LAYOUT	00
MAR 001 - E - 002	MARGATE SEWAGE TREATMENT WORKS EXISTING ELECTRICAL DISTRIBUTION AND RETICULATION LAYOUT - SINGLE LINE DIA- GRAM	00
MAR 001 - E - 003	MARGATE SEWAGE TREATMENT WORKS OPTIMISED AND NEW MAIN ELECTRICAL DISTRIBUTION AND RETICULATION LAYOUT SINGLE LINE DIAGRAM	00