



TENDER NO: UGU-07-1734-2026

REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CIDB CONTRACTOR GRADING: 9CE OR HIGHER

September 2026

PROCUREMENT DOCUMENT

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

TENDER CLOSING DATE: 12:00, FRIDAY 16 OCTOBER 2026

ISSUED BY:

Ugu District Municipality

PO Box 33
Port Shepstone
4240
Tel : (035) 688 3536
Email : thami.mbona@ugu.gov.za

COMPILED BY:

DLV 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:

24 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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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 2)

CIDB CLASSIFICATION: 9CE OR HIGHER

Contract №: UGU-07-1734-2026

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 2)**. The minimum specifications are detailed in the tender document. It is required that tenderers must have a CIDB grading of **9CE or Higher**.

It is a condition of this tender that the **9CE or higher** Main Civil contractor sub-contracts with a Mechanical contractor having a CIDB grading to or higher than **8ME (should they not have this capacity in-house)**. 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 **10th September 2026 until 16th September 2026**. **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, **CIDB and the National Treasury's e-Tender Portals** for free downloading by Tenderers as from **10th September 2026**. 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°51'2.57"S; 30°21'51.49"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 **Thursday, 17th September 2026 at 10h00**.

The closing time for receipt of tenders is at **12h00 on Friday, 16 October 2026**. 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 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

Tenderers are required to bring their copies of the tender document to the compulsory tender briefing and site visit for signing by the Employer.

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
Experience of Key Personnel	30
Relevant Project experience (Main contractor- 9CE)	20
Relevant Project experience (Main contractor/Sub-contractor- 8ME)	20
Quality Management System	5
Preliminary Programme	5
Financial Resources (Bank Rating)	15
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	Main Contractor Ownership	
	1. 100% owned by black people	5
	2. At least 51% owned by black people	4
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.*

“UGU-07-1734-2026, REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)”

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
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. TENDERERS 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-07-1734-2026</td></tr><tr><td>Title of Tender</td><td>REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)</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-07-1734-2026	Title of Tender	REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)	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 favourable 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 <u>must</u> 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; - Proof of valid CIDB registration/s, as per CIDB Grading requirements within this tender document, must be provided; 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, 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.
F3.11.2	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 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).

SCORING FUNCTIONALITY

Reference Page	Criterion	Assessment	Points Awarded	Portfolio of evidence	Max Score
T.69-76: P: Key Personnel & Q: Curriculum Vitae Format of Key Personnel	Experience of Key Personnel	Project Manager with minimum NQF Level 7 Degree in Civil/Mechanical 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)	15	Certified Copy of Degree/certificates and signed curriculum vitae (CV) including contactable referees.	30
		+10 years' experience – 15 points 7-10 years' experience – 10 points 5-6 years' experience – 5 points Less than 5 – 0 Points			
		Site Agent with minimum NQF Level 5 Diploma in Civil/Mechanical Engineering/Project Management with +10 years experience in Wastewater / Water Treatment Plant projects. Professionally Registered or ECSA/SACPCMP (Pr.Eng / Pr.Tech.Eng / Pr. CMP)	10	Certified Copy of Degree/certificates and signed curriculum vitae (CV) including contactable referees.	
		+10 years experience – 10 points 7-10 years experience – 8 points 5-6 years experience – 6 points Less than 5 – 0 Points			
		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)	5	Certified Copy of Degree/certificates and signed curriculum vitae (CV) including contactable referees.	
		+10 years experience – 5 points 5-10 years experience – 3 points Less than 5 – 0 Points			

	T66 & 68: O1: Schedule Of The Tenderer's Experience (Main Contractor-CE)	Civil: Specific targeted experience in Wastewater/ Water Treatment Plant / Sanitation projects within the last 10 years	The contractor has been appointed and successfully completed at least 3 projects for Sewer reticulation, 1 project for Wastewater/Water treatment works & 1 project for Sewer pumpstations- each priced at > R30 million within the last 10 years.	20	3x Appointment letters and Completion Certificates for Sewer reticulation- 9 Points 1x Appointment letters and Completion Certificates for Wastewater/Water treatment Works-8 points 1x Appointment letters and Completion Certificates Sewer pumpstations - 3 points	20
			The contractor has been appointed and successfully completed at least 2 projects for Sewer reticulation, 1 project for Wastewater/Water treatment works & 1 project for Sewer pumpstations- each priced at > R30 million within the last 10 years	17	2x Appointment letters and Completion Certificates for Sewer reticulation- 6 Points 1x Appointment letters and Completion Certificates for Wastewater/Water treatment works-8 points 1x Appointment letters and Completion Certificates Sewer pumpstations - 3 points	
			The contractor has been appointed and successfully completed at least 1 projects for Sewer reticulation, 1 project for Wastewater/Water treatment works & 1 project for Sewer pumpstations- each priced at > R30 million within the last 10 years	14	1x Appointment letters and Completion Certificates for Sewer reticulation- 3 Points 1x Appointment letters and Completion Certificates for Wastewater/Water treatment works-8 points 1x Appointment letters and	

					Completion Certificates Sewer pumpstations - 3 points	
			All other experience.	0	Appointment letter or Completion certificate only	
	T67-68: Schedule Of The Tenderer's Experience (Main Contractor-ME/ Sub contractor-ME)	M&E: Specific targeted experience in Wastewater/ Water Treatment Plant / Sanitation projects within the last 10 years	The contractor has been appointed and successfully completed at least 1 project for Wastewater/Water treatment works & 3 project for Sewer pumpstations- each priced at > R20 million within the last 10 years.	20	1x Appointment letters and Completion Certificates for Wastewater/Water treatment plant-8 points 3x Appointment letters and Completion Certificates Sewer pumpstations - 12 points	20
			The contractor has been appointed and successfully completed at least 1 project for Wastewater/Water treatment works & 2 project for Sewer pumpstations- each priced at > R20 million within the last 10 years.	16	1x Appointment letters and Completion Certificates for Wastewater/Water treatment plant-8 points 2x Appointment letters and Completion Certificates Sewer pumpstations - 8 points	
			The contractor has been appointed and successfully completed at least 1 project for Wastewater/Water treatment works & 1 project for Sewer pumpstations- each priced at > R20 million within the last 10 years.	12	1x Appointment letters and Completion Certificates for Wastewater/Water treatment plant-8 points 1x Appointment letters and Completion Certificates Sewer pumpstations - 4 points	

F3.11.3			All other experience.	0	Appointment letter or Completion certificate only	
	T.105: 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:79 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 timelines, task dependencies and critical path	2	Provisional Programme on MS Projects or similar project management software	
			Not Supplied	0		
	T:64-65 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	0		

			Facility Less than R10 000 000.00 or No bank guarantee or credit facility			
	T 69 & T.89: 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 T69, 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:			100

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).

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;

P_m = 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	Main Contractor Ownership	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:

Ownership	Points		Portfolio of Evidence
	80/20	90/10	
100% Black owned	10	5	Valid and Certified BBBEE Certificate or Sworn Affidavit
51% or more Black owned	4	2	
than less 51% Black owned	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.
- 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

	2	An EME or QSE which is at least 51% owned by black people.	50%	2	1	audited financial statements (as appropriate)																				
	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																					
<u>Promotion of Local Business</u> Preference will be given to tenderers who are locally based, as follows:																										
<table><tr><th colspan="2" rowspan="2">Description</th><th colspan="2">Price Preference</th><th rowspan="2">Portfolio of Evidence</th></tr><tr><th>80/20</th><th>90/10</th></tr><tr><td>1</td><td>Enterprise Located within the District Municipality - Rural</td><td>4</td><td>2</td><td rowspan="3">Municipal rates or copy of signed lease agreement or confirmation letter from Ward Councillor</td></tr><tr><td>2</td><td>Enterprise Located within the District Municipality - Urban</td><td>3</td><td>1.5</td></tr><tr><td>3</td><td>Enterprise Located within the Province</td><td>1</td><td>0.5</td></tr></table>							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
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																							
<u>Other Specific Goals</u> 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:																										
<table><tr><th colspan="2">Price Preference</th><th rowspan="2">Portfolio of Evidence</th></tr><tr><th>80/20</th><th>90/10</th></tr><tr><td>2</td><td>1</td><td>Company registration certificate (CK Document) and ID copies of members ID's/medical certificate/ confirmation from WVA</td></tr></table>							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												
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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:		Valid and Certified BBBEE Certificate or Sworn Affidavit. Company registration certificate (CK Document), and audit-ed financial statements.
1. 100% owned by black people	10	
2. at least 51% owned by black people	8	
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	Municipal rates or copy of signed lease agreement or confirmation letter from Ward Councillor. ID copies of members ID's/medical certificate/ confirmation from WVA
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:		Valid and Certified BBBEE Certificate or Sworn Affidavit. Company registration certificate (CK Document), and audit-ed financial statements.
1. 100% owned by black people	5	
2. at least 51% owned by black people	4	
Empowerment:		
4. An EME or QSE which is 100% owned by black people	2	Municipal rates or copy of signed lease agreement or confirmation letter from Ward Councillor. ID copies of members ID's/medical certificate/ confirmation from WVA
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 sated 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.41
B	Record of Addenda to Tender Documents	T.42
C	Certificate of Authority of an Entity	T.43– T.47
D	Registration Certificates of an Entity	T.48
E	CIDB Registration	T.49
F	BBBEE Certificate	T.50
G	Bidder's questionnaire (MBD1)	T.51 – T.52
H	Declaration of Interest (MBD 4)	T.53 – T.54
I	Declaration for Procurement above R10 mil (MBD 5)	T.55 – T.56
J	Preference Points Claim Form (MBD 6.1)	T.57 - T.61
K	Affidavit Of Good Standing That Will Be Incorporated into The Contract	T.62
L	Schedule Of All Work Provided For An Organ Of The State Over The Last Five Years	T.63
M	Banking Details	T.64
N	Declaration of Financial Capacity	T.65
O1	Schedule of the tenderer's experience (Main contractor- CE)	T.66
O1	Schedule of the tenderer's experience (Main contractor/Subcontractor- ME)	T.67-T.68
P	Key Personnel	T.69
Q	Curriculum Vitae Format of Key Personnel	T.70 – T.76
R	Schedule of Plant and Equipment	T.77
S	Schedule of Proposed Sub-Contractors	T.78
T	Provisional Programme	T.79
U	Schedule of labour content	T.80
V	Training schedule	T.81
W	Amendments, Qualifications and Alternatives	T.82 – T.83
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.84
Y	Tax Clearance Certificate	T.85
Z	Declaration of Payment of Municipal Services	T.86
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.87
Z2	Declaration Of Tenderer Who Does Not Have a Municipal Rates Account But Is Renting Or Leasing An Office	T.88

2 Other documents that will be incorporated into the contract:

AA	Contractor's Health and Safety Declaration	T.89
AB	National Treasury's Central Supplier database	T.90
AC	Proforma Forms to Be Completed By Successful Tenderer	T.91 – T.103
AD	Declaration of Solvency or Liquidation	T.104
AE	Quality Management System	T.105

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.....

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 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. Minimum requirement is 9CE, it is a condition of this tender that the 9CE or higher Main Civil contractor sub-contracts with a Mechanical contractor having a CIDB grading to or higher than 8ME (should they not have this capacity in-house). Proof of both **9CE and 8ME** or higher CIDB registrations to be provided.

(If not registered, attach proof that the enterprise can be registered with the CIDB within 10 days)

Registered Name	Registration Number

F: BBBEE 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-07-1734-2026	CLOSING DATE:	16 October 2026	CLOSING TIME:	12H00
DESCRIPTION	REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)				
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="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 favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the bidder or their 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

-
- J:

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

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

NB: BEFORE COMPLETING THIS FORM, 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) 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:

$$\begin{array}{ccc}
 \mathbf{80/20} & \mathbf{or} & \mathbf{90/10} \\
 \\
 \mathbf{Ps} = 80 \left(1 - \frac{Pt - P_{min}}{P_{min}} \right) & \mathbf{or} & \mathbf{Ps} = 90 \left(1 - \frac{Pt - P_{min}}{P_{min}} \right)
 \end{array}$$

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmin = 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:				
1. 100% owned by black people	5	10		
2. At least 51% owned by black people	4	8		
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 Veterans	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 initialled 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.
- 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.
 - 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

01: SCHEDULE OF THE TENDERER'S EXPERIENCE (MAIN CONTRACTOR- CE)

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 contractor has been appointed and successfully completed at least 3 projects for Sewer reticulation, 1 project for Wastewater/Water treatment works & 1 project for Sewer pumpstations- <i>each project above priced at > R30 million within the last 10 years.</i>		
TOTAL POINTS		Maximum Points = 20		

The contractor must obtain referee reports from the client's representative or the Client using the form on page T.68.

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

DATE:

O2: SCHEDULE OF THE TENDERER'S EXPERIENCE (MAIN CONTRACTOR-ME/ SUB-CONTRACTOR-ME)

Tenderers are to provide references for **FOUR (4)** 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 contractor has been appointed and successfully completed at least 1 project for Wastewater/Water treatment works & 3 projects for Sewer pumpstations- each project above priced at > R20 million within the last 10 years.		
TOTAL POINTS		Maximum Points = 20		

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

SIGNATURE:

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:

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 initialled 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 T69, 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, Fourth 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 (PHASE 2)**

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, Fourth 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:
 XXXXXXXXXXXX

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 :**

XXXXXXXX

**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-07-1734-2026 – REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

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

By the representative of the Tenderer, deemed to be duly 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 Fourth 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 Fax No: 034 983 2765 e-mail: anesh@dlveng.co.za

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 favour 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
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 104 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-07-1734-2026, REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAM-
AGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)** 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 OHS Act 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 initialled by the Tenderer.

7. ARITHMETICAL ERRORS

Arithmetical errors found in the Bill of Quantities as a result of faulty multiplication of 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 instalments 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

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
 CONTRACT NUMBER: UGU-07-1734-2026
 SECTION: SCHEDULE 1: GENERAL

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1		SANS 1200A	SCHEDULE 1: GENERAL				
		8.3	SCHEDULED FIXED-CHARGE AND VALUE RELATED ITEMS				
1.01		PS A8.3.1	Contractual Requirements	Sum	1		
		PS A 8.3.2	Establishment of Facilities on the Site:				
		PS A 8.3.2.1	Facilities for Engineer (SANS 1200 AB)				
1.02		PS A 8.3.2.1 (a)	Engineers Office	Sum	1		
1.03		PS A 8.3.2.1 (b)	Communication costs (cellular phone)	Sum	1		
1.04		PS A 8.3.2.1 (c)	Nameboards (2 No.)	Sum	1		
1.05		PS A 8.3.2.1 (d)	Computer facilities complete with printer, modem with 4G connection	Sum	1		
1.06		PS A 8.3.2.1 (e)	Provision of survey equipment	Sum	1		
		PS A 8.3.2.2	Facilities for Contractor				
1.07		PS A 8.3.2.2 (a)	Offices and storage sheds	Sum	1		
1.08		PS A 8.3.2.2 (b)	Workshops	Sum	1		
1.09		PS A 8.3.2.2 (c)	Laboratories	Sum	1		
1.10		PS A 8.3.2.2 (d)	Ablution and latrine facilities	Sum	1		
1.11		PS A 8.3.2.2 (e)	Tools and equipment	Sum	1		
1.12		PS A 8.3.2.2 (f)	Water supplies, electric power and communications	Sum	1		
1.13		PS A 8.3.2.2 (g)	Dealing with water (Sub-clause 5.5)	Sum	1		
1.14		PS A 8.3.2.2 (h)	Access (Sub-clause 5.8)	Sum	1		
1.15		PS A 8.3.2.2 (i)	Plant.	Sum	1		
1.16		PS A 8.3.3	Other fixed-charge obligations	Sum	1		
1.17		PS A 8.3.4	Removal of Site establishment	Sum	1		
TOTAL CARRIED FORWARD							

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		PSA 8.3.5	OHS Act Obligations:				
1.18		PS A B.8.3.5.1	Contractor's initial obligations in respect of the Occupation Health and Safety Act and Contractual Regulations	Sum	1		
1.19		PS A B.8.3.5.2	Occupational Health and Safety Act	Sum	1		
1.20			iii) Fulfil legislated and/or specified requirements for blasting (incl. submission of plans).	Sum	1		
1.21		PSA 8.3.3.3	Environmental Management Plan Obligations	Sum	1		
		8.4	SCHEDULED TIME-RELATED ITEMS				
1.22		PSA 8.4.1	Contractual Requirements.	Sum	1		
1.23		8.4.2	Operate and maintain facilities on the Site for duration of Construction:	Sum	1		
		PSA 8.4.2.1	Facilities for the Employer's Agent:				
1.24		8.4.2.1. (a)	Engineers Office	Sum	1		
1.25		8.4.2.1. (b)	Provision of name board	Sum	1		
1.26		8.4.2.1. (c)	Provision of cellular phone	Sum	1		
1.27		8.4.2.1. (d)	Provision of survey equipment	Sum	1		
1.28		PS A 8.4.2.2	Facilities for Contractor:				
1.29		8.4.2.2 (a)	Offices and storage sheds	Sum	1		
1.30		8.4.2.2 (b)	Workshops	Sum	1		
1.31		8.4.2.2 (c)	Laboratories	Sum	1		
1.32		8.4.2.2 (d)	Ablution and latrine facilities	Sum	1		
1.33		8.4.2.2 (e)	Tools and equipment	Sum	1		
1.34		PSA 8.4.2.2. (f)	Water supplies, electric power and communications	Sum	1		
1.35		8.4.2.2 (g)	Dealing with water (Sub-clause 5.5)	Sum	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE:	REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER	UGU-07-1734-2026
SECTION:	SCHEDULE 1: GENERAL

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CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
2.1		SANS1200 C	SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)				
2.1.1	LI	8.2.1	Clear vegetation and grub	m²	51 710		
2.1.2	LI	8.2.2	Remove large trees and tree stumps of girth up to 1 m	No.	185		
2.1.3		8.2.10	Remove topsoil to a nominal depth of 150mm and stockpile	m²	51 710		
2.1.4		PSC 8.2.11	Take Down and Re-erect Fence	m	470		
2.1.5		PSC 8.2.12	Demarcation Staking	m	150		
2.1.6		PSC 8.2.13	Fencing of Pipeline Servitudes in populated areas	m	600		
2.1.7		PSC 8.2.14	Removal and Re-Erection of Structures	Prov Sum	1	R 600 000.00	R 600 000.00
2.1.8			(i) Overheads, charges and profit on item 2.1.7 above	%	600 000		
		SANS1200 DB	PIPE TRENCHES				
2.2			EXCAVATION				
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for up to 110 mm dia. pipes for total trench depth:				
2.2.1	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	140		
2.2.2			b) Exceeding 1,0 m but not exceeding 2,0 m	m	40		
2.2.3			c) Exceeding 2,0 m but not exceeding 3,0 m	m	20		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for 160 mm dia. pipes for total trench depth:				
2.2.4	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	4 200		
2.2.5			b) Exceeding 1,0 m but not exceeding 2,0 m	m	1 200		
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for 200 mm dia. pipes for total trench depth:				
2.2.8	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	1 428		
2.2.9			b) Exceeding 1,0 m but not exceeding 2,0 m	m	408		
2.2.10			c) Exceeding 2,0 m but not exceeding 3,0 m	m	204		
2.2.11			d) Exceeding 3,0 m but not exceeding 4,0 m	m	10		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for 250 mm dia. pipes for total trench depth:				
2.2.12	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	210		
2.2.13			b) Exceeding 1,0 m but not exceeding 2,0 m	m	60		
2.2.14			c) Exceeding 2,0 m but not exceeding 3,0 m	m	30		
2.2.15			d) Exceeding 3,0 m but not exceeding 4,0 m	m	10		
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for 315 mm dia. pipes for total trench depth:				
2.2.16	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	210		
2.2.17			b) Exceeding 1,0 m but not exceeding 2,0 m	m	60		
2.2.18			c) Exceeding 2,0 m but not exceeding 3,0 m	m	30		
2.2.19			d) Exceeding 3,0 m but not exceeding 4,0 m	m	10		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for 355 mm dia. pipes for total trench depth:				
2.2.20	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	315		
2.2.21			b) Exceeding 1,0 m but not exceeding 2,0 m	m	90		
2.2.22			c) Exceeding 2,0 m but not exceeding 3,0 m	m	45		
2.2.23			d) Exceeding 3,0 m but not exceeding 4,0 m	m	10		
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for 450 mm dia. pipes for total trench depth:				
2.2.24	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	140		
2.2.25			b) Exceeding 1,0 m but not exceeding 2,0 m	m	40		
2.2.26			c) Exceeding 2,0 m but not exceeding 3,0 m	m	20		
2.2.27			d) Exceeding 3,0 m but not exceeding 4,0 m	m	10		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
2.3		8.3.2(b)	Extra-over items 2.2.1-2.2.27 included for:				
2.3.1			1) Intermediate excavation	m³	3 296		
2.3.2			2) Hard rock excavation by Hand (Pneumatic)	m³	165		
2.3.3			3) Hard rock excavation (Controlled Blasting)	m³	7 416		
2.3.4			4) Boulder excavation Class A	m³	824		
2.3.5			5) Boulder excavation Class B	m³	824		
2.3.6		8.3.2(c)	6) Excavate and dispose of unsuitable material from trench bottom (Provisional)	m³	824		
2.3.7			7) Hand excavation and backfill only where ordered by the Engineer	m³	1 000		
2.3.8			8) Backfill stabilised with 5% cement where directed by the Engineer	m³	165		
2.4		8.3.3	EXCAVATION ANCILLARIES				
		8.3.3.1	Make-up deficiency in backfill material				
2.4.1		8.3.3.1(a)	i) From other necessary excavations on site	m³	1 285		
2.4.2		8.3.3.1(a)	ii) From Borrow Pits	m³	9 640		
2.4.3		8.3.3.1(a)	iii) From Commercial Sources	m³	1 928		
2.4.4		8.3.3.3	ii) Compaction in road reserves to 90% Mod Aashto as instructed by Employer's Agent	m³	1 170		
2.5		8.3.4	Shoring of trenches				
2.5.1			Opposite existing pipe service where instructed by Employer's Agent in the following depth Categories)				
2.5.2			a) Exceeding 0,0m but not exceeding 2,0 m.	m	960		
2.5.3			b) Exceeding 2,0m but not exceeding 3,0 m.	m	480		
2.5.4			c) Exceeding 3,0m but not exceeding 4,0 m.	m	1		
2.5.5			d) Exceeding 4,0m but not exceeding 5,0 m.	m	1		
2.5.6			e) Exceeding 5,0m but not exceeding 6,0 m.	m	1		
2.5.7			f) Exceeding 6,0m but not exceeding 7,0 m.	m	1		
2.5.8			g) Exceeding 7,0m but not exceeding 8,0 m.	m	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
2.6		8.3.5	EXISTING SERVICES THAT INTERSECT OR AJOIN A PIPE TRENCH				
		8.3.5(a)	Services that intersect a trench as listed by SANS				
2.6.1	LI		1) Electrical cable	No.	190		
2.6.2			2) Telecommunication cable	No.	190		
2.6.3			3) Sewer mains	No.	190		
2.6.4			4) Stormwater pipes	No.	190		
2.6.5			5) Water pipes	No.	190		
2.6.6			6) Gas pipes	No.	5		
2.6.7			7) Other	No.	190		
		8.3.5(b)	Services that adjoin a trenches listed by SANS				
2.6.8	LI		1) Electrical cable	m	600		
2.6.9	LI		2) Telecommunication cable	m	600		
2.6.10	LI		3) Sewer mains	m	600		
2.6.11	LI		4) Stormwater pipes	m	600		
2.6.12	LI		5) Water pipes	m	600		
2.6.13	LI		6) Gas pipes	m	10		
2.6.14	LI		7) Other	m	600		
2.7			FINISHING:				
2.7.1		8.3.6.1	Reinstate road surfaces complete with all courses.	m	90		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 2: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
2.7.2			a) Asphalt of thickness up to 20mm in parking areas and sidewalks	m ²	90		
2.7.3			b) Asphalt of thickness exceeding 20mm up to 40mm in roadway	m ²	90		
2.7.4		PSDB8.3.8	i) Cut, remove and disposing of existing asphalt (unlimited freehaul)	m ³	9		
2.7.5		PSDB8.3.9	ii) Cut, remove and disposing of existing concrete (unlimited freehaul)	m ³	9		
2.7.6		PSDB8.3.10	Extra-over item 2.7.1 to 2.7.5 for excavate by hand in soft material with hand tools, as instructed by the Engineer	m ³	9		
2.7.7		PSDB8.3.11	Extra-over items 2.7.1 to 2.7.5 for stabilising backfill with cement (CEM II 32.5) and compaction to 93% MOD AASHTO	m ³	9		
2.8		8.3.12	Reinstate paving blocks, (where applicable) for driveways, walkways etc.				
2.8.1			a) Block paving (60mm)	m ²	50		
2.8.2			b) Interlocking block paving (80mm)	m ²	50		
		PSDB8.3.14	Extra over item 2.8.1 to 2.8.2 for supplying new paving blocks, to match existing, only where original paving blocks were broken (as instructed by Engineer)				
2.8.3			a) Block paving (60mm)	m ²	50		
2.8.4			b) Interlocking block paving (80mm)	m ²	50		
2.8.4.1			Saw cutting of existing slab, with breaking and disposal of concrete	m	50		
2.8.5		PSDB8.3.15	Reinstate concrete slab, with necessary jointing, up to 150mm thick, Concrete Class 25/19	m ²	50		
2.8.6		PSDB8.3.18(a)	Reinstate existing brick walls complete with brick-force as required	m ²	50		
2.8.7		PSDB8.3.18(b)	Reinstate existing Palisade fencing and support posts	m	50		
2.8.8		PSDB8.3.18(c)	Reinstate existing wire fencing	m	50		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
 CONTRACT NUMBER UGU-07-1734-2026
 SECTION: SCHEDULE 3: BEDDING (PIPES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS 1200LB	SCHEDULE 3: BEDDING (PIPES)				
3.1			BEDDING FOR SUBSURFACE DRAIN PIPES				
		8.2.1	Provision of Bedding from trench excavation within 0,5 km including screening				
3.1.1			Selected granular material	m³	18		
3.1.2			Selected fill material	m³	460		
		8.2.2.2	From borrow pits (Provisional)				
3.1.3			1) Selected granular material	m³	18		
3.1.4			2) Selected fill material	m³	153		
		PSLB 8.2.2	Supply only of bedding by importation:				
			From commercial sources:				
3.1.5			1) Selected granular material	m³	3 535		
3.1.6			2) Selected fill material	m³	921		
		PSLB 8.2.6	Drainage Layer				
3.1.7			a) Stone Filling	m³	48		
3.1.8			b) Dump rock	m³	240		
3.1.9			c) Geofabric filter material (Bidim Grade A4 or similar)	m²	1 640		
3.1.10	7.1.11	8.2.4	Encasing of pipes (all Diameters) in Concrete (20Mpa)	m³	55		
3.1.11	7.1.11	8.2.5	Overhaul of Material for Bedding Cradle and Selected Fill Blanket	m³.km	3 245		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 4: SEWERS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS1200 LD	SCHEDULE 4: SEWERS				
		8.2	SCHEDULED ITEM				
		8.2.1	Supply , Lay, Joint, Bed, backfill on flexible bedding Pipes Complete with couplings and Test pipeline				
4.1			a) Pipes: Class 34 Solid wall or 400kPa uPVC, SANS 791/1601/21138-1/21138-2/21138-3				
4.1.1			i) 110mm dia.	m	200		
4.1.2			ii) 160mm dia.	m	6 000		
4.1.3			iii) 200mm dia.	m	2 040		
4.1.4			iv) 250mm dia.	m	300		
4.1.5			v) 315mm dia.	m	450		
4.1.6			vi) 355 mm dia.	m	450		
4.2			b) Pipes: 75D Concrete pipes, SANS 791/1601/21138-1/21138-2/21138-3				
4.2.1			i) 450mm dia.	m	200		
4.2.2			ii) 525mm dia.	m	110		
4.3			MANHOLES				
			Supply and Install Manholes complete with Channels, cover & frame for depths including excvaton over and up to:				
4.3.1			a) 0m to 2.0m	No	75		
4.3.2			b) 2.0m to 3.0m	No	81		
4.3.3			c) 3.0m to 4.0m	No	19		
4.3.4			d) 4.0m to 5.0m	No	9		
4.3.5			e) 5.0m to 6.0m	No	4		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 5: GABIONS AND PITCHING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS 1200 DK	SCHEDULE 5: GABIONS AND PITCHING				
5.1		8.2.1	Surface preparation for bedding of gabions				
5.1.1			a) Cavities filled with approved excavated material	m³	1500		
5.1.2			b) Cavities filled with grade 15 concrete	m³	100		
5.2		8.2.2	Gabions				
			Supply, place, fill with stones, lacing and bracing gabions boxes or mattresses, the rate should include the supply of stones:				
			(Double twist hexagonal wire mesh to SANS 1580:2005) Mesh Type 80 with 2,7/3,7mm Class A Galvanized and uPVC coated wire				
5.2.1			a) Gabion mattresses: 2m x 1m x 0.6m	m³	1950		
5.2.2			b) Gabion boxes: 1m x 1m x 1m	m³	812		
5.3		8.2.4	Supply and install Geotextile membrane:				
5.3.1			a) AG150 - Minimum Energy Absorption - 4,0kN/m	m²	4062		
5.4		8.2.5	Pitching				
5.4.1			a) Medium pitching - plain	m²	140		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 6: PIPE JACKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SABS 1200LG	SCHEDULE 6: PIPE JACKING				
6.1		8.2.1	Jacking establishment:				
6.1.1			Fixed charges	Sum	1		
6.1.2			Time-related charges for jacking operations up to 400m in length	Sum	1		
6.2		8.2.4	Excavation for jacking - excavate for pipes at jacking face, including removal and disposal of material within 0,5 km of working area in:				
6.2.1			a) Soft cohesive soil	m ³	38		
6.2.2			b) Non-cohesive soil	m ³	76		
6.2.3			c) Hard pickable soil	m ³	38		
6.2.4			d) Cobbles and boulders larger than 150 mm but not larger than 0,10 m ³	m ³	114		
6.2.5			e) Very hard material occurring in bulk requiring extraordinary techniques for breaking, or boulders larger than 0,01 m ³ , or both	m ³	610		
6.2.6			f) A mixture of two or more of (a) to (e) above	m ³	38		
6.2.7			Overhaul in excess of 0,5 km for disposal of surplus excavation	m ³ .km	7624		
6.3		8.2.2	Supply of 100D Concrete Jacking Pipe larger than installed pipe road crossings				
6.3.1			i) for 110 mm diameter	m	1		
6.3.2			ii) for 160 mm diameter	m	1		
6.3.3			iii) for 200 mm diameter	m	1		
6.3.4			iv) for 250 mm diameter	m	1		
6.3.5			v) for 315 mm diameter	m	1		
6.3.6			vi) for 355 mm diameter	m	1		
6.3.7			vii) for 450 mm diameter	m	18		
6.3.8			viii) for 600 mm diameter	m	36		
6.3.9			ix) for 900 mm diameter	m	306		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 6: PIPE JACKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
6.4.4			iv) for 250 mm diameter	m	1		
6.4.5			v) for 315 mm diameter	m	1		
6.4.6			vi) for 355 mm diameter	m	1		
6.4.7			vii) for 450 mm diameter	m	18		
6.4.8			viii) for 600 mm diameter	m	36		
6.4.9			ix) for 900 mm diameter	m	306		
6.5		8.2.9	Stabilization of unstable areas where ordered:				
6.5.1			a) Provision and establishment of equipment on site, and removal on completion of operation	Sum	1		
6.5.2			b) Operation of equipment	day	40		
6.6		8.2.9	Grouting of voids where ordered:				
6.6.1			a) Provision and establishment of equipment on site, and removal on completion of operation	Sum	1		
6.6.2			b) Operation of equipment	day	40		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
7.1			SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS				
		SANS1200 DC	EARTHWORKS (Pipe Trenches)				
7.1.1	LI	8.2.1	Clear vegetation and grub	m²	76 538		
7.1.2	LI	8.2.2	Remove large trees and tree stumps of girth up to 1 m	No.	185		
7.1.3		8.2.10	Remove topsoil to a nominal depth of 150mm and stockpile	m²	76 538		
7.1.4		PSC 8.2.11	Take Down and Re-erect Fence	m	3 750		
7.1.5		PSC 8.2.12	Demarcation Staking	m	150		
7.1.6		PSC 8.2.13	Fencing of Pipeline Servitudes in populated areas	m	1		
7.1.7		PSC 8.2.14	Removal and Re-Erection of Structures	Prov Sum	1	R 3 000 000.00	R 3 000 000.00
7.1.8			(I) Overheads, charges and profit on item 2.1.7 above	%	3 000 000		
		SANS1200 DB	PIPE TRENCHES				
7.2			EXCAVATION				
		8.3.2(a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for up to 110 mm dia. pipes for total trench depth:				
7.2.1	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	11 375		
7.2.2			b) Exceeding 1,0 m but not exceeding 2,0 m	m	3 250		
7.2.3			c) Exceeding 2,0 m but not exceeding 3,0 m	m	125		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
7.3		8.3.2(b)	Extra-over items 2.2.1-2.2.27 included for:				
7.3.1			1) Intermediate excavation	m³	5 460		
7.3.2			2) Hard rock excavation by Hand (Pneumatic)	m³	8 190		
7.3.8			8) Backfill stabilised with 5% cement where directed by the Engineer	m³	165		
7.4		8.3.3	EXCAVATION ANCILLARIES				
		8.3.3.1	Make-up deficiency in backfill material				
7.4.1		8.3.3.1(a)	i) From other necessary excavations on site	m³	1 374		
7.4.2		8.3.3.1(a)	ii) From Borrow Pits	m³	9 619		
7.4.3		8.3.3.1(a)	iii) From Commercial Sources	m³	1 374		
7.4.4		8.3.3.3	ii) Compaction in road reserves to 90% Mod Aashto as instructed by Employer's Agent	m³	1 170		
7.5		8.3.4	Shoring of trenches				
7.5.1			Opposite existing pipe service where instructed by Employer's Agent in the following depth Categories)				
7.5.2			a) Exceeding 0,0m but not exceeding 2,0 m.	m	1 625		
7.5.3			b) Exceeding 2,0m but not exceeding 3,0 m.	m	813		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
7.6		8.3.5	EXISTING SERVICES THAT INTERSECT OR AJJOIN A PIPE TRENCH				
		8.3.5(a)	Services that intersect a trench as listed by SANS				
7.6.1	LI		1) Electrical cable	No.	250		
7.6.2			2) Telecommunication cable	No.	250		
7.6.3			3) Sewer mains	No.	250		
7.6.4			4) Stormwater pipes	No.	250		
7.6.5			5) Water pipes	No.	250		
7.6.6			6) Gas pipes	No.	25		
7.6.7			7) Other	No.	20		
		8.3.5(b)	Services that adjoin a trenches listed by SANS				
7.6.8	LI		1) Electrical cable	m	900		
7.6.9	LI		2) Telecommunication cable	m	900		
7.6.10	LI		3) Sewer mains	m	900		
7.6.11	LI		4) Stormwater pipes	m	450		
7.6.12	LI		5) Water pipes	m	900		
7.6.13	LI		6) Gas pipes	m	50		
7.6.14	LI		7) Other	m	40		
7.7			FINISHING:				
7.7.1		8.3.6.1	Reinstate road surfaces complete with all courses.	m	1250		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
7.7.2			a) Asphalt of thickness up to 20mm in parking areas and sidewalks	m²	75		
7.7.3			b) Asphalt of thickness exceeding 20mm up to 40mm in roadway	m²	90		
7.7.4		PSDB8.3.8	i) Cut, remove and disposing of existing asphalt (unlimited freehaul)	m³	12		
7.7.5		PSDB8.3.9	ii) Cut, remove and disposing of existing concrete (unlimited freehaul)	m³	6		
7.7.6		PSDB8.3.10	Extra-over item 2.7.1 to 2.7.5 for excavate by hand in soft material with hand tools, as instructed by the Engineer	m³	500		
7.7.7		PSDB8.3.11	Extra-over items 2.7.1 to 2.7.5 for stabilising backfill with cement (CEM II 32.5) and compaction to 93% MOD AASHTO	m³	500		
7.8		8.3.12	Reinstate paving blocks, (where applicable) for driveways, walkways etc.				
7.8.1			a) Block paving (60mm)	m²	600		
7.8.2			b) Interlocking block paving (80mm)	m²	600		
		PSDB8.3.14	Extra over item 2.8.1 to 2.8.2 for supplying new paving blocks, to match existing, only where original paving blocks were broken (as instructed by Engineer)				
7.8.3			a) Block paving (60mm)	m²	500		
7.8.4			b) Interlocking block paving (80mm)	m²	500		
7.8.4.1			Saw cutting of existing slab, with breaking and disposal of concrete	m	5000		
7.8.5		PSDB8.3.15	Reinstate concrete slab, with necessary jointing, up to 150mm thick, Concrete Class 25/19	m²	250		
7.8.6		PSDB8.3.18(a)	Reinstate existing brick walls complete with brick-force as required	m²	500		
7.8.7		PSDB8.3.18(b)	Reinstate existing Palisade fencing and support posts	m	500		
7.8.8		PSDB8.3.18(c)	Reinstate existing wire fencing	m	500		
TOTAL CARRIED FORWARD TO SUMMARY							

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CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		SANS 1200LB	BEDDING (PIPES)				
7.9			BEDDING FOR SUBSURFACE DRAIN PIPES				
		8.2.1	Provision of Bedding from trench excavation within 0,5 km including screening				
7.9.1			Selected granular material	m³	458		
7.9.2			Selected fill material	m³	692		
		8.2.2.2	From borrow pits (Provisional)				
7.9.3			1) Selected granular material	m³	686		
7.9.4			2) Selected fill material	m³	231		
		PSLB 8.2.2	Supply only of bedding by importation:				
			From commercial sources:				
7.9.5			1) Selected granular material	m³	3 432		
7.9.6			2) Selected fill material	m³	1 385		
		PSLB 8.2.6	Drainage Layer				
7.9.7			a) Stone Filling	m³	21		
7.9.8			b) Dump rock	m³	1		
7.9.9			c) Geofabric filter material (Bidim Grade A4 or similar)	m²	205		
7.9.10	7.1.11	8.2.4	Encasing of pipes (all Diameters) in Concrete (20Mpa)	m³	25		
7.9.11	7.1.11	8.2.5	Overhaul of Material for Bedding Cradle and Selected Fill Blanket	m².km	10 500		
TOTAL CARRIED FORWARD TO SUMMARY							

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CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
7.10		SANS1200 LD	SEWERS				
		8.2	SCHEDULED ITEM				
		8.2.1	Supply , Lay, Joint, Bed, backfill on flexible bedding Pipes Complete with couplings and Test pipeline				
			a) Pipes: Class 34 Solid wall or 400kPa uPVC, SANS 791/1601/21138-1/21138-2/21138-3				
7.10.1			i) 110mm dia.	m	16 250		
		8.2.6	ERF CONNECTIONS				
			Supply, bed, lay, joint, and test new property connection including all fittings related to the erf connections:				
7.10.2			a) 110mm dia. uPVC Class 34 Solid wall(10m)	No	250		
7.10.3		8.2.7	Encasing of pipes in concrete (20Mpa concrete)	m³	100		
		8.2.8	Anchor blocks				
7.10.4		PSL 8	Provide concrete anchor blocks of any size	m³	100		
7.10.5		8.2.10	Permanent Plug Stoppers	No	100		
		8.2.6	Erf Connections Direct as per Dwg. No.				
7.10.6			Inspection Eyes	No.	250		
7.10.7			Inspection Chambers	No.	120		
7.10.8			a) Connecting Sewer: Direct Connection	No.	50		
7.10.9			b) Connecting Sewer: Sloping Connection 1m	No.	50		
7.10.10			c) Connecting Sewer: Sloping Connection 2m	No.	25		
7.10.11			d) Connecting Sewer: Sloping Connection 3m	No.	25		
7.10.12			e) Connecting Sewer: Sloping Connection 4m	No.	25		
7.10.13			f) Connecting Sewer: Sloping Connection 5m	No.	25		
7.10.14			g) Connecting Sewer: Sloping Connection 6m	No.	25		
TOTAL CARRIED FORWARD TO SUMMARY							

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CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 8: AREATION BASIN

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 8: AREATION BASIN				
8.1			General and Concrete repairs on existing tank				
8.1.1			Remove all existing handrail baseplates and bolts from concrete	No	12		
8.1.2			Expose concrete surface by sandblasting or cleaning with high pressure water jet	m2	2032		
8.1.3			Level corroded concrete floor /wall area with Pro-Struct 513 levelling mortar or Sika equivalent	m2	2032		
8.1.4			Desludging of tank. Removal using Honey sucker or pump. Including safe disposal	m3	2842		
8.1.5			Removal of heavy grit/sediment from tank	m3	1894		
8.1.6			Sum for complete removal of areation pipework	Sum	1		
8.1.7			Construct stainless steel canopy over existing areation pipes	m	94		
8.1.8			Mentis handrail, ball type MT 90 complete installed. Stainless steel 316L SS SCH 10	m	110		
8.1.9			Grid floor, bearer 25 x 4.5 mm light duty, 450 mm wide, galvanized & banded over canals	m2	10		
8.1.10			Mentis stair threads, 900 x 245 mm, 6 per stair	No	2		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 8: AREATION BASIN

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.2.5	PIPE FITTINGS Steel				
			Copon coated = Cc; Galvanised = gs; oef=one end flanged; bef = both ends flanged; pf=puddle flange pipework 316L SS, class Sch 10. Flanges SABS 1123 table 1000/3				
8.2			a) 90°				
8.2.1			200 mm dia bef	No	6		
8.3			TEE PIECE (Flanged 1000/3)				
8.3.1			a) 200mm x 200mm	No	2		
8.3.2			a) 500mm x 500mm	No	2		
8.4			200 mm dia (mm)				
8.4.1			a) L=3000, bef	No	12		
8.4.2			b) L=295, bef	No	8		
8.6			150 mm dia (mm)				
8.6.1			a) L=1000, oef	No	2		
			75mm uPVC class 9 with holes drilled for aeartor dome installation	m	720		
8.7			200 mm Ø NB, Supply and install fittings below including all fixures				
8.7.1			a) RSV Gate valve class 10	No	6		
8.7.2			b) Flange adapter VJ or Simlair	No	6		
8.7.3			Supply and install 8m long stem and spindle valve wheel	No	6		
8.7.4			Supply and install Stainless steel ladder and protective cage H=8m	No	2		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 8: AREATION BASIN

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
8.8			250 mm dia (mm)				
8.8.1			a) L=3000, bef	No	12		
8.8.2			b) L=295, bef	No	8		
8.8.3			c) L = 6000 bef	No	8		
8.9			Supply and install disc fine bubble diffuser with high grade EPDM membrane with integrated backflow preventer, support dish and halter or screw on ring with air inlet threaded (female). Airflow rate ± 3 m³/h to 5 m³/h with daily peak flow = 4.5 m³/h	No	660		
8.10			Supply & install pipe saddle (clamp/bolted) with socket sealing ring agianst header pipe (EPDM rubber or PVC)	no	660		
8.11			Drill airhole into pipe with patented method not to drop drilling material into pipe	no	660		
8.12			Drill airhole into pipe with patented method not to drop drilling material into pipe	no	660		
8.13			Test and commission	sum	1		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 9: UPPER INLET

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 9: UPPER INLET				
9.1			General and Concrete repairs on existing inlet canal				
9.1.1			Remove all existing handrail baseplates and bolts from concrete	No	24		
9.1.2			Expose concrete surface by sandblasting or cleaning with high pressure water jet	m2	430		
9.1.3			Level corroded concrete floor /wall area with Pro-Struct 513 levelling mortar or Sika equivalent	m2	430		
9.1.4			Desludging of tank. Removal using Honey sucker or pump. Including safe disposal	m3	135		
9.1.5			Mentis handrail, ball type MT 90 complete installed. Stainless steel 316L SS SCH 10	m	90		
9.1.6			Grid floor, bearer 25 x 4.5 mm light duty, 450 mm wide, galvanized & banded over canals	m2	30		
9.1.7			Mentis stair threads, 900 x 245 mm, 6 per stair	No	2		
9.1.8			Supply, deliver, install, and commission a , wall-mounted Rising Spindle Sluice Gate (Penslock) suitable for wastewater treatment applications. Including frame and other fixtures	No	12		
9.1.9			Demolish existing rising mainhole and dispose of all material	No	2		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 9: UPPER INLET

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.2.5	PIPE FITTINGS Steel				
			Copon coated = Cc; Galvanised = gs; oef=one end flanged; bef = both ends flanged; pf=puddle flange pipework 316L SS, class Sch 10. Flanges SABS 1123 table 1000/3				
9.2			a) 90°				
9.2.1			150 mm dia bef	No	6		
9.3			TEE PIECE (Flanged 1000/3)				
9.3.1			a) 150mm x 150mm	No	2		
9.3.2			a) 200mm x 200mm	No	2		
9.4			150 mm dia (mm)				
9.4.1			b) L=295, bef	No	4		
9.5			150mm Ø NB, Supply and install fittings below including all fixtures				
9.5.1			a) RSV Gate valve class 10	No	3		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 9: UPPER INLET

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
9.6			Mechanical equipment				
9.6.1			600 mm Wide SS 304L drip tray for screenings	no	1		
9.6.2			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		
9.7			Flow measuring equipment				
9.7.1			a) Open canal Ultrasonic liquid level detector & 304L SS frame for mounting over the canal	no	1		
9.7.2			b) Flow meter transmitter with data logger with connection to MCC & PC in Admin control room	no	1		
9.7.3			c) 304L SS canopy mounted on top of frame over Ultrasonic liquid level detector	no	1		
9.7.4			Electric motor driven mechanical screen complete with frame, cover plates, chain, sprockets, shute etc. - 304L SS	no	1		
9.7.5			Electrical motor driven centreless screw conveyor with U-canal, cover plates & washwater spray bar - 304 L SS	no	1		
9.7.6			3CR12 - A-frame conveyor support carriers	no	2		
9.7.7			Electrical motor driven screenings screw compactor, venturi, U-canal, cover plates, washwater spray bar & outlet shute - 304 L SS	no	1		
9.7.8			300 l Trolley bin for screenings - 3CR12	no	1		
9.7.9			Sluice gate mm Ø Gate valve with electrical actuator	No	5		
TOTAL CARRIED FORWARD TO SUMMARY							

SECTION: SCHEDULE 10: LOWER INLET

C. 47

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 11: MEDIUM PRESSURE PIPELINES

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SABS 1200 L	SCHEDULE 11: MEDIUM PRESSURE PIPELINES				
11.1			Supply, handle, lay and bed and test uPVC pipes to SABS 966-1, on class C bedding and test				
11.1.1			a) 160 mm dia class 16	m	835		
11.1.2			b) 200 mm dia class 16	m	250		
11.1.3			c) 250 mm dia class 16	m	120		
11.1.4			d) 315 mm dia class 16	m	80		
			PIPE FITTINGS uPVC				
			Extra over 5.1 & 5.2 for supplying, laying and bedding of fittings and couplings complete				
11.2			uPVC Class 9 bends				
11.2.1			a)(i) 160 mm dia x 90°	No	6		
11.2.2			a)(ii) 160 mm dia x 45°	No	6		
11.2.3			a)(iii) 160 mm dia x 22½°	No	6		
11.2.4			a)(iv) 160 mm dia x 11¼°	No	6		
11.2.5			b)(i) 200 mm dia x 90°	No	6		
11.2.6			b)(ii) 200 mm dia x 45°	No	6		
11.2.7			b)(iii) 200 mm dia x 22½°	No	6		
11.2.8			b)(iv) 200 mm dia x 11¼°	No	6		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 11: MEDIUM PRESSURE PIPELINES

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
11.2.9			c)(i) 250 mm dia x 90°	No	6		
11.2.10			c)(ii) 250 mm dia x 45°	No	6		
11.2.11			c)(iii) 250 mm dia x 22½°	No	6		
11.2.12			c)(iv) 250 mm dia x 11¼°	No	6		
11.2.13			d)(i) 315 mm dia x 90°	No	6		
11.3			CI TEES to fit uPVC				
11.3.1			150 x 150 mm (DL 04)	No	4		
11.4			FLANGE ADAPTORS TO uPVC PIPES				
11.4.1			160 mm dia	No	6		
11.5			Supply and Install Manholes complete with Channels, cover & frame for depths including excvaton over and up to:				
11.5.1			i) 0m to 2.0m	No	10		
11.5.2			ii) 2.0m to 3.0m	No	3		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 12: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS1200 C	SCHEDULE 12: EARTHWORKS (PIPE TRENCHES)				
12.1.1	LI	PS C 8.2.1	Clear vegetation and grub	m²	3 005		
12.1.2	LI	PS 8.2.3	Remove large trees and tree stumps of girth up to 1 m	No.	3		
12.1.3		8.2.3	Remove topsoil to a nominal depth of 150mm and stockpile	m²	3 005		
12.1.4		PS C 8.2.5	Take Down and Re-erect new fences	m	50		
12.1.5		PSC 8.2.5	Demarcation Staking	m	10		
12.1.6		PSC 8.2.6	Fencing of Pipeline Servitudes in populated areas	m	2		
		SANS1200 DB	PIPE TRENCHES				
12.2		PS DB 8.3.2	EXCAVATION				
		8.3.1 (a)	Excavate in all materials for trenches, backfill, compact, and dispose of surplus/ unsuitable material, for up to 450 mm dia. pipes for total trench depth:				
12.2.1	LI		a) Exceeding 0,0 m but not exceeding 1,0 m	m	334		
12.2.2			b) Exceeding 1,0 m but not exceeding 2,0 m	m	334		
12.2.3			c) Exceeding 2,0 m but not exceeding 3,0 m	m	168		
12.2.4			d) Exceeding 3,0 m but not exceeding 4,0 m	m	10		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 12: EARTHWORKS (PIPE TRENCHES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.3.1 (c)	Extra-over items 12.2.1 to 12.2.4 included for:				
12.2.5			a) Intermediate excavation	m³	541		
12.2.6			b) Hard rock excavation	m³	271		
12.3		PS DB 8.3.3	EXCAVATION ANCILLARIES				
		PS DB 8.3.3.1	Make-up deficiency in backfill material				
12.3.1		8.3.3.1(a)	From other necessary excavations on site	m³	1 020		
12.3.2		8.3.3.3	Compaction in road reserves to 90% Mod Aashto as instructed by Employer's Agent	m³	50		
		8.3.4	Shoring of trenches				
12.3.3			Opposite existing pipe service where instructed by Employer's Agent in the following depth categories:				
12.3.4			a) Exceeding 0,0m but not exceeding 2,0 m.	m	55		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 13: BEDDING (PIPES)

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS 1200LB	SCHEDULE 13: BEDDING (PIPES)				
			BEDDING FOR SUBSURFACE DRAIN PIPES				
13.1		8.2.1	Provision of Bedding from trench excavation within 0,5 km including screening				
13.1.1	LI		Selected granular material	m³	17		
13.1.2	LI		Selected fill material	m³	18		
13.2		8.2.2.2	From borrow pits (Provisional)				
13.2.1			a) Selected granular material	m³	49		
13.2.2			b) Selected fill material	m³	13		
		PSLB 8.2.2	Supply only of bedding by importation:				
13.3			From commercial sources:				
13.3.1			Selected granular material complying with SANS 1083	m³	29		
13.3.2			Selected fill material	m³	8		
		PSLB 8.2.6	Drainage Layer				
13.3.3			a) Stone Filling	m³	10		
13.3.4			b) Dump rock	m³	15		
13.3.5			c) Geofabric filter material (Bidim Grade A4 or similar)	m²	150		
13.3.6	7.1.11	8.2.4	Encasing of pipes (all Diameters) in Concrete (20Mpa)	m³	5		
13.3.7	7.1.11	8.2.5	Overhaul of Material for Bedding Cradle and Selected Fill Blanket	m³.km	350		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 14: SECONDARY SEDIMENTATION TANKS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 14: SECONDARY SEDIMENTATION TANKS				
		SANS 1200D	EARTHWORKS				
14.1			BULK EXCAVATION				
		8.3.2	Excavate in all material and transport to crusher or spoil. Contractor to crush & grade rock material at crusher site for re-use				
14.1.1			1) To form terraces	m³	730		
14.1.2			2) For structures below terrace level	m³	1365		
14.2			Restricted excavation				
14.2.1			1) For foundations	m³	2210		
14.2.2			2) For pipes coming from under structures, up to 3 m deep and 1 m wide	m³	200		
14.2.3			3) For outlet canal	m³	350		
14.2.4			4) For column footings	m³	300		
14.3			Extra over for excavating in:				
14.3.1			Intermediate material	m³	1377		
14.3.2			Hard material using chemical rock breaking or pecker to prevent damage to existing structures	m³	1071		
14.3.3			Hard material using controlled blasting	m³	918		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 14: SECONDARY SEDIMENTATION TANKS

TOTAL BROUGHT FORWARD							
14.4			Import material for backfilling in over break areas				
14.4.1			Import G5 material for backfill	m³	1330		
14.4.2			Backfill & compact in layers with G5 material	m³	780		
14.4.3			Mix G5 material with 5% cement and backfill & compact in layers	m³	335		
14.4.4			Cement for soilcrete where indicated by employers agent	t	56		
14.5			Import material for foundation bedding layers				
14.5.1			75mm No-fines concrete layer beneath tank floor panels (including placing and compaction)	m³	38		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
 CONTRACT NUMBER: UGU-07-1734-2026
 SECTION: SCHEDULE 14: SECONDARY SEDIMENTATION TANKS

TOTAL BROUGHT FORWARD							
		SANS 1200DB	EARTHWORKS (Pipe trenches)				
		SANS 1200 DB	EXCAVATION PIPE TRENCHES (Pipes connecting units)				
		PSDB 8.3.2 (a)	Excavate in all materials for trenches, backfill, compact and dispose of surplus or unsuitable material				
14.6			0.9 m Deep for 110 & 160 mm Ø sleeve pipes to the following trench widths				
14.6.1			1) 600 mm	m	200		
14.6.2			2) 900 mm	m	100		
14.7			For 300 mm PVC pipes, 900 mm trench width to the following depths				
14.7.1			1) 1.0 to 1.5 m	m	200		
14.7.2			Z - lock concrete stormwater pipes				
14.7.3			450 mm Ø pipes - trench 1000 mm wide				
14.7.4			1) 1 to 2 m deep	m	200		
14.7.5			2) >2 to 3 m deep	m	100		
14.7.6			600 mm Ø pipes - trench 1200 mm wide				
14.7.7			1) 1 to 2 m deep	m	200		
14.7.8			2) >2 to 3 m deep	m	45		
14.8.1			Preparation of ground surfaces (fine grading and stone removal), supply and application of a hydroseed slurry comprising an approved indigenous seed mix, wood fiber mulch, fertilizer, and tackifier by specialized mechanical means, including all watering, weeding, and maintenance until 80% vegetation cover is established.	m2	600		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 15: CONCRETE STRUCTURAL

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS 1200G	SCHEDULE 15: CONCRETE STRUCTURAL				
15.1			Rough formwork Vertical				
15.1.1			a) Side of foundations outside 400 mm wide	m ²	143		
15.1.2			b) Walls	m ²	835		
		8.2.5	Rough formwork to narrow widths ≤ 300 mm				
15.1.3			a) Edges, risers, walkways & walls	m ²	18		
15.2		8.2.2	Smooth formwork				
			a) Horizontal				
15.2.1			1) Walkway slabs, slabs & landings	m ²	221		
15.2.2			2) Beam above weir openings	m ²	3.6		
15.2.3			3) Inlet canals in tanks	m ²	19		
15.2.4			4) Down pipe boxes	m ²	2		
15.2.5			5) Concrete Pier	m ²	43		
		8.2.2	b) Vertical				
15.2.6			1) Walls	m ²	612		
15.2.7			2) Inside & outside of canals (wider than 300 mm)	m ²	177		
15.2.8			3) Inside & outside of down pipe boxes	m ²	0		
15.2.9			4) Inside & outside of inlet boxes	m ²	39		
15.2.10			5) Columns	m ²	115		
15.2.11			6) Concrete Pier	m ²	52		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 15: CONCRETE STRUCTURAL

TOTAL BROUGHT FORWARD							
		8.2.2	c) Sloping				
15.2.12			1) Stairs	m²	23		
15.2.17			4) 150 x 150 mm x 750 mm long mm chamfers at overflow weirs	no	160		
			d) Smooth formwork to rebates & chamfers				
15.2.18			1) 30 x 30 mm chamfers	m	149		
		8.2.6	Boxed out holes up to 300 mm deep (inside recess for key bonding)				
15.2.19			1) Square, up to 0.5 m² area	no	2		
15.2.20			2) Square, up to 1.0 m² area	no	2		
15.3		8.3	REINFORCEMENT				
		8.3.1	Steel bars				
			a) Mild steel				
15.3.1			All diameters	t	18.5		
			b) High tensile steel bars				
15.3.2			All diameters	t	111		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

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SECTION: SCHEDULE 15: CONCRETE STRUCTURAL

TOTAL BROUGHT FORWARD							
15.4		8.4	STRENGTH CONCRETE				
		8.4.2	a) 15/19 Mpa				
15.4.1			1) In blinding layer, 75 mm thick	m³	88		
15.4.2			2) In encasing of pipes under structures	m³	145		
15.4.3			3) In filling of over break in rock under structures	m³	110		
		8.4.3	b) 20/13 Mpa				
15.4.4			1) Benching 800 mm to 50 mm - steel float	m³	4.8		
15.4.5			2) Benching 250 mm to 50 mm - steel float	m³	16		
15.4.6			3) Benching 500 mm to 200 mm - steel float	m³	4.8		
		8.4.3	c) 35/19 Mpa				
15.4.7			1) In foundations	m³	232		
15.4.8			2) In floor slabs	m³	122		
15.4.9			3) In walls	m³	374		
15.4.10			4) In inlet boxes & canals	m³	39		
15.4.11			5) In walkways	m³	17.2		
15.4.12			6) In stairs	m³	5		
15.4.13			7) In inclined at sludge cones	m³	11		
15.4.14			8) In sludge draw off box	m³	8		
15.4.15			9) In sludge cone	m³	180		
15.4.16			10) In weirs	m³	52		
15.4.17			11) In concrete pads	m³	18		
15.4.18			12) In central concrete pier	m³	87		
15.4.19			13) In columns	m³	16		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 15: CONCRETE STRUCTURAL

	TOTAL CARRIED FORWARD	
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SECTION: SCHEDULE 15: CONCRETE STRUCTURAL

TOTAL BROUGHT FORWARD						
15.7			CASTING IN OF PIPE SECTIONS			
15.7.1			1) 500 Ø At Sludge Draw Off Box	no	2	
15.7.2			2) 100 Ø Drainage Pipes under Floor Panels	no	2	
15.7.3			3) 150 Ø At inlet box	no	2	
15.7.4			4) Supply and cast in 50mm uPVC drainage pipes in concrete pads beneath tank floor	m	140	
15.7.5			5) Supply and cast in 150mm vitro external drain pipe with hep sleeves	m	40	
15.8			CASTING IN OF U-PROFILE WEIR & HANDSTOP FRAMES IN RECTANGULAR OPENINGS			
15.8.1			1) 500 mm wide x 800 mm deep	no	2	
15.8.2			2) 500 mm wide x 550 mm deep	no	4	
15.8.3			3) 700 mm wide x 750 mm deep	no	10	
15.9			FORMING PERMANENT VOIDS IN WALLS & FLOORS			
			a) 200 mm thick concrete			
15.9.1			1) 75 mm Ø in wall (uPVC pipe shuttering)	no	32	
15.9.2			2) 100 x 100 mm in wall	no	108	
15.9.3			3) 350 x 350 mm in bottom of inlet canals	no	16	
			b) 300 mm thick concrete			
15.9.4			1) 750 mm wide x 150 mm deep at overflow weir	no	48	
TOTAL CARRIED FORWARD						

SECTION: SCHEDULE 15: CONCRETE STRUCTURAL

TOTAL BROUGHT FORWARD						
15.10		8.5	JOINTS			
			a) Vertical between foundations & floors, 300 mm			
15.10.1			1) Supply & cast in Rearguard water stop, 200 mm wide, four pillar, Sika or similar	m	470	
15.10.2			2) Bond breaker supplied and applied to foundation	m ²	123	
15.10.3			3) Supply 20 x 20 mm Tear-out strip, attached to top of foundation before casting of floor	m	470	
15.10.4			4) Supply & apply Polyurethane joint sealer 20 x 20 mm	m	470	
15.10.5			5) Supply and install resin bonded cork filler to construction joints	m	470	
TOTAL CARRIED FORWARD TO SUMMARY						

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 16: SST STRUCTURAL STEELWORK

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS 1200 HA	SCHEDULE 16: SST STRUCTURAL STEELWORK				
16.1		PSHA-5.2.10	Supply and deliver to site tubular handrails with type B90 stanchions with anchor bolts & nuts (stanchion spacing=1.8 m), hot dipped galvanized to SANS 763	m	80		
16.1.1			90° Corners (2 pipes each)	no	28		
16.1.2			Closures	no	16		
16.1.3			Self closing half gate	no	8		
16.1.4			Install complete handrail on site including drilling and grouting in of anchor bolts (± 110 stanchions)	m	80		
16.1.5			Priming all rails & stanchions with a "Galvo Grip" primer	m²	118		
16.1.6			Painting all rails with 2 coats of Plascon enamel (yellow) paint	m²	90		
16.1.7			Painting all stanchions with 2 coats of Plascon enamel (black) paint	m²	28		
16.1.8			Supply & install stainless steel railings, complete with gate and anchor bolts (± 3.5 m long) to Drawing 14-100(A)-DTL-004	no	8		
16.2			HANDSTOPS, WEIRS, V-NOTCH & REGTANGULAR WEIRS AND BUILT IN FRAMES				
16.2.1			Supply and install type A Stainless steel weir plate -	no	108		
16.2.2			Supply and install type B stainless steel weir plate -	no	108		
16.2.3			Supply & built in stainless steel U channel frame	no	4		
16.2.4			Supply and slide in type A aluminium U plate weir	no	4		
16.2.5			Supply and install stainless steel U channel for handstops	no	4		
16.2.6			Supply and install aluminium handstops	no	4		
16.2.7			Supply and build in galvanized mild steel step irons in tank wall, spaced at 300 mm centres.	no	20		
16.3			VALVES AND HYDRAULIC FITTINGS				
16.3.1			Supply and install 300mm diameter circular relief flap in floor panels	no	8		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 16: SST STRUCTURAL STEELWORK

TOTAL BROUGHT FORWARD							
16.4			EQUIPMENT at SEDIMENTATION TANKS				
16.4.1			Complete rotating half bridge with walkway, vertical tubes for scraper blades, scraper blades with rubber scraping blade edge, scum plate etc. (304L SS)	no	2		
16.4.2			Centre support mounting with bearing (304L SS)	no	2		
16.4.3			Electrical drive motor assembly with gearbox & drive wheel	no	2		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 17: SST MEDIUM PRESSURE PIPE LINES

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS 1200 L	SCHEDULE 17: SST MEDIUM PRESSURE PIPE LINES				
		8.2.1	Steel pipes to SANS 719, Grade B, t = 4.5 mm, epoxy coated inside & outside, outside also wrapped with bitumen fibre glass coating				
			BEF = both ends flanged				
			OEF = one end flanged				
			PF = puddle flange				
			PE = plain ended				
17.1			a) Pipes & pipe specials, Flanges 1000/3 SANS 1123				
			• 500 mm NB				
17.1.1			PS-R13: L = 6000 mm OEF	no	2		
17.1.2			PS-R14: L = 600 mm OEF, PF 150 mm from PE	no	7		
17.2			Stainless steel pipes & fittings, ASTM A312, PSW_304L, wall thickness t, to Sch10S (100 mm Ø, t = 3.05 mm, 150 mm Ø, t = 3.4 mm etc)				
			for abbreviations - see top C				
			• 150 mm NB				
17.2.1			PS3.1, PS4.15: 45° Elbow, long radius, welded to 2565 mm pipe, OEF, & 300 mm pipe, PF 185 mm from PE	no	2		
17.2.2			PS3.2, PS4.16: 45° Elbow, long radius, OEF, welded to 2500 mm pipe, OEF	no	4		
17.2.3			PS3.3, PS3.3A, PS4.17, PS4.17A: L = 4515 BEF	no	8		
17.2.4			PS3.10, PS3.11, PS4.6, PS4.7: 45° Elbow, long radius welded to 665 mm pipe, OEF, & 300 mm pipe, PF 185 mm from PE	no	8		
17.2.5			PS3.12, PS4.8: Y junction 150 x 200 mm	no	4		
17.2.6			PS5.6: 90° Elbow (short radius) OEF welded to pipe L = 1800 mm with PF 100 mm from PE	no	2		
17.2.7			PS5.7: L = 1465 BEF	no	2		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 17: SST MEDIUM PRESSURE PIPE LINES

TOTAL BROUGHT FORWARD						
			• 300 mm NB			
17.2.8			PS3.13, PS4.9: 300 x 200 mm Concentric reducer, 200 EF, welded to L = 6710 mm pipe, OEF	no	2	
17.3			Scum Drying beds -HDPE LINER			
17.3.6			Coarse sand (1.6 mm) (drying beds)	m³	28	
17.4			PRECAST ELEMENTS			
17.4.1			750 mm dia Plumber shaft MH section rings 250 mm	No	8	
17.4.2			1m dia Concrete manhole sections for draught tubes	m	8	
17.5			Sludge outlet pipe work tank - SS 304L Sch 40, flanges SABS 1123 Table 1000/3			
17.5.1			a) S0 1 - Pipe L = 1200, OEF, PF 150 mm FPE	No	2	
17.5.2			b) S0 2 - Pipe L = 5000, BEF	No	2	
17.5.3			c) S0 3 - 88° Bend BEF	No	2	
17.5.4			d) S0 4 - Pipe L = 2700, BEF	No	2	
17.5.5			e) S0 5 - Equal T AEF	No	2	
17.5.6			f) S0 6 - 150 mm x 50 mm reducer BEF	No	2	
17.5.7			g) S0 7 - Pipe L = 500, OEF, with PF 125 mm FPE	No	2	
17.5.8			50 mm Ø NB			
17.5.9			S0 8 - Pipe L = 1300, OEF	No	2	
17.5.10			Sum for pipework at maturation canal	Prov Sum	1	R 100 000.00
17.5.11			Allowance on above item 17.5.10	%	100000	
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		COTO	SCHEDULE 18: ACCESS ROAD AND PARKING				
18.1		C1.6	CLEARING AND GRUBBING				
		C1.6.1	Clearing:				
18.1.1		C1.6.1.1	Clearing with machines and some hand labour where necessary	ha	0.65		
		C1.6.2	Grubbing:				
18.1.2		C1.6.2.1	Grubbing with machines and some hand labour where necessary	ha	0.65		
18.2		C1.7	LOADING AND HAULING				
		C1.7.1	Loading:				
18.2.1		C1.7.1.1	Loading from stockpile using machines and some hand labour where necessary	m³	1600		
		C1.7.2	Hauling:				
		C1.7.2.1	Hauling material for use in the works and off-loading it on site of the works				
18.2.2		(a) Soil, gravel, crushed stone and Pavement Layer Material	m³-km	1000			
		C1.7.2.2	Hauling material to spoil and off-loading it at a designated spoil area:				
18.2.3		(b) Soil and gravel material	m³-km	7200			
18.2.4		(c) Boulders	m³-km	1100			
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		C3.1	DRAINS				
		C3.1.1	Excavation for open drains:				
18.3		C3.1.1.1	Excavating all material situated within the following depth ranges below the surface level using conventional methods:				
18.3.1		C3.1.4.4	(a) 0 m to 1,5 m	m³	100		
18.4.2			Extra over sub-item C3.1.4.1 for excavation in hard and boulder material, irrespective of depth	m³	5		
18.5		C3.1.5	Impermeable backfilling to subsoil drainage systems				
18.5.1		C3.1.5.2	G5 material obtained from commercial sources	m³	10		
18.5.2		C3.1.5.3	Extra over items C3.1.5.2 for stabilisation with 4,0 % CEM II (32.5) cement	m³	10		
18.6		C3.1.7	Natural permeable material in subsoil drainage systems (approved crushed stone):				
18.6.1		C3.1.7.2	Crushed stone obtained from commercial sources (13.5mm)	m³	14		
		C3.1.8	Natural permeable material in subsoil drainage systems (approved natural sand):				
18.6.2		C3.1.8.2	Natural sand from commercial sources	m³	25		
18.7		C3.1.9	Pipes in subsoil drainage systems:				
18.7.1		C3.1.9.1	U-PVC pipes and fittings, normal duty, complete with couplings (100mm dia. slotted)	m	50		
18.7.2		C3.1.10	Geotextiles (Type Kaytech U14 or similar approved)	m²	130		
18.7.3		C3.1.11	Repairing or replacing existing drainage systems	Prov Sum	1	R 15 000.00	R 15 000.00
18.7.4		C3.1.11.1	Handling cost, profit and all other charges in respect of item C3.1.15	%	15000		
TOTAL CARRIED FORWARD							

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
18.8		C3.2	CULVERTS				
		C3.2.1	Excavation for culvert structures:				
		C3.2.1.1	Excavating in all material situated within the following depth ranges below the surface level:				
18.8.1			(a) 0 m to 1,5 m	m³	10		
18.8.2			(b) Exceeding 1,5 m and up to 3,0 m	m³	120		
18.8.3		C3.2.1.4	Extra over sub-item C3.2.1.1 for excavation in hard or boulder material, irrespective of depth	m³	20		
18.9		C3.2.2	Backfilling:				
18.9.1		C3.2.2.1	Using the excavated material	m³	70		
		C3.2.2.2	Using imported selected material:				
18.9.2			(a) From sources on site (G7 or Better)	m³	50		
18.9.3			(b) From commercial sources (G5)	m³	50		
		C3.2.3	Concrete pipe culverts:				
18.9.4		C3.2.3.3	(i) On Class C bedding (300mm Dia, Spigot and Socket, 75D)	m	1		
18.9.5			(ii) On Class C bedding (600mm Dia, Spigot and Socket, 75D)	m	100		
18.9.6			(iii) On Class C bedding (750mm Dia, Spigot and Socket, 75D)	m	0		
18.9.7			(iv) On Class C bedding (900mm Dia, Spigot and Socket, 75D)	m	1		
18.9.8		C3.2.4	(v) Prefabricated concrete inlets and outlets to culverts (Kerb Inlet to detail)	No	0		
18.9.9			(vi) Prefabricated concrete inlets and outlets to culverts (Manhole to detail)	No	12		
18.9.10			(vii) Prefabricated concrete inlets and outlets to culverts (Inlet to detail)	No	15		
18.9.11			(viii) Prefabricated concrete inlets and outlets to culverts (Outlet to detail)	No	8		
		C3.2.5	Dog Bone Channel				
18.9.12		C3.2.5.1	Supply and install precast Dog Bone channel 600 x 400, inclusive of Dog Bone covers.	m	5		
TOTAL CARRIED FORWARD							

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		C3.3	CONCRETE KERBING AND CHANNELING, ASPHALT BERMS, CHUTES, DOWNPIPES, AS WELL AS CONCRETE, STONE PITCHED AND GABION LININGS FOR OPEN DRAINS				
18.10		C3.3.1	Concrete kerbing:				
		C3.3.1.1	Prefabricated kerbing (Fig 6 mountable kerbs only)				
18.10.1			(a) Fig 6 barrier kerbs only	m	1100		
		C3.3.2	Concrete kerbing-channeling combination:				
		C3.3.2.1	Prefabricated kerbing-channeling (Fig 6 mountable kerb with 300mm concrete channel as per drawing)				
18.10.2			(a) Fig 6 barrier kerb with 300mm concrete channel as per drawing	m	0		
		C3.3.3	Extra over items C3.3.1 and C3.3.2 for concrete kerbing or concrete kerbing and channeling on curves				
18.10.3		C3.3.3.1	On curves of radii more than or equal to 5,0 m but less than 20 m	m	100		
18.10.4		C3.3.3.2	On curves of radii more than or equal to 1,0 m but less than 5,0 m	m	100		
18.10.5		C3.3.8	Linings for open drains				
18.10.6		C3.3.8.1	Cast in situ concrete lining (25Mpa Concrete V-Drain)	m³	708		
18.10.7		C3.3.15	Energy dissipaters in outlet structures				
18.10.8		C3.3.15.1	Precast concrete blocks in outlet structures	No	8		
18.10.9		C3.3.9	Formwork to cast in situ concrete lining for open drains (Class F2 surface finish)				
18.10.10		C3.3.9.1	To sides with formwork on the internal face only	m2	270		
18.10.11		C3.3.9.3	To ends of slabs	m2	10		
18.10.12		C3.3.12	Reinforcement				
18.10.13		C3.3.12.3	Welded steel fabric Ref 193	kg	1100		
18.10.14		C3.3.15	Energy dissipaters in outlet structures				
18.10.15		C3.3.15.1	Precast concrete blocks in outlet structures	No	4		
18.10.16		C3.3.16	Parking Lot disable concrete ramp including concrete block for retaining wall	Sum	1		
18.10.17		C3.3.17	Parking Lot concrete staircase	Sum	1		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

TOTAL CARRIED FORWARD

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
18.12		C4.2	CUT MATERIALS				
		C4.2.4	Excavating of materials in box cuts, material obtained from				
18.12.1		C4.2.4.1	Soft excavation	m³	1200		
18.12.2		C4.2.4.2	Boulder excavation class A	m³	250		
18.12.3		C4.2.4.4	Hard excavation (other than by blasting)	m³	100		
18.12.4		C4.2.4.5	Hard excavation (by blasting)	m³	100		
18.13		C4.4	COMMERCIAL MATERIALS				
		C4.4.2	Commercial material identified by the contractor from commercial, private or other non-commercial suppliers				
18.13.1			(a) Lower selected subgrade layer (G9 Imported - 150mm thk) compacted to 95 % of MDD	m³	880		
18.13.2			(b) Upper selected subgrade layer (G7 Imported - 150mm thk) compacted to 95 % of MDD	m³	840		
18.13.3			(c) Gravel Sub-Base course layer (chemically stabilised C4), (C4 from G5 Imported - 150mm thk) compacted to 95 % of MDD - Parking layer	m³	860		
18.13.4			(d) Gravel base layer (chemically stabilised C3), (C3 from G5 Imported - 150mm thk) compacted to 97 % of MDD	m³	710		
18.14		C4.4.2.5	Fill Material in Earthworks				
18.14.1			(a) Normal or coarse fill	m³	5		
18.14.2			(b) Rock Fill	m³	500		
18.14.3			(c) Sand	m³	300		
18.15		C5.1	ROADBED				
18.15.1		C5.1.1	Roadbed construction and compaction				
18.15.2		C5.1.1.1	Compaction of in-situ material to 90 % of MDD (150mm thk)	m³	830		
TOTAL CARRIED FORWARD							

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
18.16		C5.2	FILL				
		C5.2.2	Fill construction				
		C5.2.2.1	Normal fill material in compacted layer thicknesses of 200 mm and less:				
18.16.1			(a) Compacted to 93 % of MDD	m³	860		
18.16.2			(b) Roller-pass compaction	m2	1560		
		C5.2.2.4	Rock fill material all as per Clause A5.2.7.6				
18.16.3			(a) Rock Fill	m³	30		
18.17		C5.3	ROAD PAVEMENT LAYERS				
18.17.1		C5.3.1	Compiling and implementing M&U plans for the construction of all the pavement layers	No	1		
		C5.3.2	Construction of pavement layers				
		C5.3.2.1	Construction of layers using conventional construction methods:				
18.17.2			(a) Lower selected subgrade layer (G9 Imported - 150mm thk) compacted to 95 % of MDD	m³	880		
18.17.3			(b) Upper selected subgrade layer (G7 Imported - 150mm thk) compacted to 95 % of MDD	m³	840		
18.17.4			(c) Gravel Sub-Base course layer (G5 Natural Gravel or better - 150mm) compacted to 95 % of MDD	m³	870		
18.17.5			(d) Gravel base layer (chemically stabilised C3), (C3 from G5 Imported - 150mm thk) compacted to 97 % of MDD	m³	710		
TOTAL CARRIED FORWARD							

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ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
18.18		C5.4	STABILIZATION				
		C5.4.2	Chemical stabilisation				
18.18.1		C5.4.2.1	(a) Chemical stabilisation (150mm thk) of pavement layers (base)	m³	860		
18.18.2		C5.4.2.2	(b) Chemical stabilisation (150mm thk) of pavement layers (base) using labour enhanced methods of construction (in restricted areas)	m³	30		
		C5.4.5	Cementitious stabilisation agents for pavement layers				
		C5.4.5.1	Addition of cementitious stabilisation agents for pavement layers				
18.18.3			(a)(i) Cement (for Upper subbase)	t	58		
18.18.4		C5.4.10	Provision and application of water for curing	kl	115		
18.18.5		C5.4.11	Curing by covering with the subsequent layer	m²	5570		
18.18.6		C5.4.14	Trial section for a chemically stabilised layer	m³	100		
18.19		C13.3	STEEL REINFORCEMENT				
		C13.3.1	Reinforcement for:				
			(a) Concrete Road Section Slab:				
18.19.1			(b) Ref 245 Mesh Wire	kg	1070		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

TOTAL CARRIED FORWARD		

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
18.23		C11.2	NON-STRUCTURAL GABIONS				
		C11.2.1	Foundation trench excavation:				
		C11.2.1.1	Excavating all material situated within the following depth ranges below the surface level				
18.23.1			(a) 0 m to 1,5 m	m³	5		
18.23.2		C11.2.2	Surface preparation for bedding the gabion boxes and mattresses	m²	5		
		C11.2.3	Gabion boxes and mattresses:				
18.23.3		C11.2.3.1	(i) Galvanized gabion boxes, Length 1m, Width 2m, Depth 1m and nominal diameter of mesh wire 2.7mm, mesh size 80mm x 100mm	m³	5		
18.23.4			(ii) Galvanized gabion boxes, Length 2.0m, Width 2m, Depth 1m and nominal diameter of mesh wire 2.7mm, mesh size 80mm x 100mm.	m³	5		
18.23.5		C11.2.3.3	(iii) Galvanized gabion mattresses, Length 2m, Width 1m, Depth 0.23mm, mesh size 80 x 100mm nominal diameter of mesh size 2.2mm, and 1m diaphragm spacing.	m³	4		
18.23.6		C11.2.4	Geotextile (kaytech grade A4 or similar).	m²	15		
18.24		C11.4	ROAD RESTRAINT SYSTEMS				
		C11.4.1	Complete galvanized system compliant to SANS 1350:				
18.24.1		C11.4.1.1	(a) On timber posts (Drawing reference SD1101)	m	95		
18.24.2		C11.4.1.2	(b) End treatments where single guardrail sections are specified (Drawing reference SD1102)	No	4		
		C11.4.4	Extra over for horizontally curved guard rails				
18.24.3		C11.4.4.1	Extra over C11.4.1 for horizontally curved guard rails factory bent to a radius of less than 45 m	m	164		
		C11.4.5	Additional guardrail posts for 3,81 m systems:				
18.24.4		C11.4.5.1	Timber	No	5		
		C11.4.6	Reflective plates				
18.24.5		C11.4.6.1	Steel plates	No	16		
TOTAL CARRIED FORWARD							

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
18.25		C11.5	FENCING				
		C11.5.3	Moving existing fences and gates:				
18.25.1			(a) Security fences	m	20		
18.25.2		C11.5.3.2	Gates	No	1		
18.26		C11.6	ROAD SIGNS				
		C11.6.1	Road signboards with painted or coloured semi-matt background. Symbols, lettering and borders in semi- matt black or in Class I retro-reflective material, where the sign board is constructed from:				
		C11.6.1.3	Prepainted galvanized steel plate:				
18.26.1			(a) Area exceeding 0,5 m2 but not 2,0 m2	m²	5		
18.26.2			(b) Area exceeding 2,0 m2 but not 10 m2	m²	0		
		C11.6.1.7	Regulatory signs, permanent				
18.26.3			(a) 600 mm diameter (aluminium sheet)	No	1		
		C11.6.1.9	Warning signs, permanent				
18.26.4			(a) 600mm size (aluminium sheet)	No	20		
		C11.6.2	Extra over on item C11.6.1 for using:				
		C11.6.2.1	Background of retro-reflective material:				
18.26.5			(a) Class I	m²	5		
		C11.6.2.2	Lettering, symbols, numbers, arrows, emblems and borders of retro-reflective material:				
18.26.6			(b) Class III	m²	5		
		C11.6.3	Road sign supports (overhead road sign structures excluded):				
18.26.7		C11.6.3.2	Timber (150mm diameter)	m	50		
		C11.6.8	Danger plates at culverts/structures				
18.26.8		C11.6.8.1	Size 150 x 600 mm (timber post and reflective material)	No	0		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

C.77

SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

TOTAL CARRIED FORWARD

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SECTION: SCHEDULE 18: ACCESS ROAD AND PARKING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE		AMOUNT
TOTAL BROUGHT FORWARD								
18.31		C9.1	ASPHALT LAYERS					
		C9.1.1	Asphalt mix Design					
		C9.1.1.2	Sand skeletal mixes					
18.31.1			(a) Continuously graded base or surface (HMA and IB Design)	Lump Sum	1			
		C9.1.2	Construction of trial sections					
		C9.1.3	Application of bond coat					
18.31.2		C9.1.3.1	Stable –grade 30 % net bitumen emulsion as specified. Applied with a calibrated distributor	l	325			
18.31.3		C9.1.3.2	Applied in restricted areas using a portable pressure sprayer	l	50			
18.31.4		C9.1.3.3	Applied by hand using brushes on all exposed transverse and longitudinal construction joints	l	10			
		C9.1.5	Asphalt Surfacing					
		C9.1.5.1	New construction					
			Asphalt surfacing 30 mm thick using 60/70 penetration-grade bitumen:					
18.31.5		C9.1.5.1.1	(a) Stone Skeletal mix - Continously graded as defined (30mm, HMA 60/70 PGB, IB, using paver)	m²	588			
		C20.1	TESTING MATERIALS AND JUDGEMENT OF WORKMANSHIP					
18.31.6		B.C20.1.6	(a) Other special tests requested by the Engineer	Prov Sum	1	R	15 000.00	R 15 000.00
18.31.7			(b) Handling cost and profit in respect of sub item B81.02 (a) above	%	15000			
		B.C20.1.7	Cost of Testing:					
18.31.8			(a) Straight edge, 3m long.	No	2			
TOTAL CARRIED FORWARD TO SUMMARY								

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SECTION: SCHEDULE 19: CONCRETE

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SANS1200 GA	SCHEDULE 19: CONCRETE				
19.1		PSG8.1.1	FORMWORK				
		8.2.1	Rough:				
19.1.1			a) Vertical plane walls	m²	150		
		8.2.2	Smooth:				
19.1.2			a) Vertical to wall and roof	m²	250		
19.1.3			b) Roof support shattering	m²	69		
19.1.4			c) Smooth formwork to walls supporting pipes	m²	50		
19.1.5			d) Smooth formwork for pump plinths and floor slab	m²	2		
19.1.6			e) Smooth formwork for drains	m²	50		
19.1.7			f) Narrow widths (up to 300 mm wide):	m²	408		
19.2		PSG8.1.2.2 & 8.1.2.3	REINFORCEMENT				
		8.3.1	Mild steel bars:				
19.2.1			a) R 10	t	0.1		
		8.3.2	High-tensile steel bars:				
19.2.2			a) Y10	t	7.6		
19.2.3			b) Y12	t	30		
19.2.4			c) Y16	t	30		
19.2.5			d) Y20	t	8		
		8.3.2	High-tensile welded mesh of:				
19.2.6			a) Ref 193	m²	163		
19.2.7			b) Ref 245	m²	163		
19.2.8			c) Ref 395	m²	82		
TOTAL CARRIED FORWARD							

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SECTION: SCHEDULE 19: CONCRETE

TOTAL BROUGHT FORWARD							
19.3.3			ii) Blinding	m ³	10		
			b) Class 25/19 for:				
19.3.4			i) Surface Slabs	m ³	82		
19.3.5			ii) Roof slab	m ³	12		
19.3.6			iii) Foundation footings	m ³	300		
19.3.7			iv) Foundation	m ³	6		
			c) Class 30/19 for:				
19.3.8			i) Walls	m ³	44		
19.3.9			ii) Floor slab	m ³	3		
19.3.10			iii) Beams	m ³	301		
			d) Class 35/19 for:				
19.3.11			i) Slabs	m ³	5		
		PSG8.4.4	Unformed surface finishes:				
		8.4.4 (a)	a) Wood-floated finish				
19.3.12			i) Footings and foundation	m ²	281		
		8.4.4 (b)	b) Steel-floated finish				
19.3.13			i) Floor	m ²	10		
19.3.14			ii) Beams	m ²	300		
19.3.15			iii) Roof	m ²	10		
TOTAL CARRIED FORWARD							

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SECTION: SCHEDULE 19: CONCRETE

TOTAL BROUGHT FORWARD						
			Steel float finish to concrete pump bases.	m ²	30	
19.3.16			a) Steel float finish to concrete channel.	m	78	
19.3.17			b) Power float finish to pump house floor slab	m ²	56	
19.3.18			c) Steel float to wall narrow widths	m	32	
19.3.19			d) Wood float to concrete apron and verandah area	m ²	150	
19.3.20			e) Wood float to concrete roof slab	m ²	112	
19.3.21			f) Wood float finish to concrete piers	m ²	20	
19.4		PSG8.5	JOINTS			
19.4.1			a) Two parts grey polysulphide sealant in floor/plinth joint 10mm x 10mm including 13mm bituminous impregnated softboard up to 200mm deep	m	23	
19.4.2		PSG8.12	b) Construction joint to include 10mm thick jointex with 10x 10mm tear off strip and 10 x 10mm approved sealant with polyethelene bond break backing tape, along concrete apron & verandah.	m	156	
19.4.3			c) Saw cut joint 3mm x 35mm cleaned out with compressed air and filled with backing chord & 6mm x6mm polysulphide sealer	m	80	
19.4.4			d) Slip joint between wall and roof slab, two layers tempered hardboard smooth faces together and graphite greased	m	374	
		PSG8.9	Casting items in concrete:			
19.4.5			a) Up to 300 mm nominal bore in up to 300 mm thick concrete	No	18	
19.4.6			b) Over 300 mm up to 600 mm nominal bore in up to 300 mm thick concrete	No	2	
TOTAL CARRIED FORWARD						

SECTION: SCHEDULE 19: CONCRETE

TOTAL BROUGHT FORWARD						
19.5			GROUTING			
			a) Grouting in of pipes in walls and floors			
19.5.1			i) 300 mm x 300 mm openings	No	8	
19.5.2			ii) 400 mm x 400 mm openings	No	6	
19.5.3			iii) 500 mm x 500 mm openings	No	6	
			b) Grouting in of holding down bolts			
19.5.4			i) Pumpstation	No	20	
19.5.5			Allowance for concrete works as instructed by engineer	Prov Sum	1	R 350 000.00
19.5.6			Handling cost and profit in respect of sub-item 19.5.5 above.	%	R 350 000.00	
TOTAL CARRIED FORWARD TO SUMMARY						

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 20: SUPERSTRUCTURE

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		PA	SCHEDULE 20: SUPERSTRUCTURE				
20.1			BRICKWORK				
20.1.1		PA - 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	504		
20.1.2			One brickwall in NFX bricks	m²	40		
20.1.3			150mm wide brick reinforcement built in horizontally every third course	m	481		
20.1.4			Brick on edge header course over door and window openings	m	28		
		PA - 4.1.2	Air bricks				
20.1.5			230 x 152 clay vermin proof built in	No	16		
20.1.6			233 mm x 175 plastic air vent built in	No	16		
20.1.7			Pre-cast concrete lintels above doors and windows built in 330 wide x 100mm thick x 2100 mm long	No	16		
20.1.8			Fibre cement window sills 150 x 10 mm to in side face of windows.	m	21		
20.2		PA - 4.17	WATERPROOFING				
20.2.1		PA4.4	One layer of 375 micron damp proof course 330mm wide in walls	m	55		
20.2.2			250 micron USB Green Water proof sheeting under surface beds	m²	30		
20.2.3			to smooth concrete as per manufacture's specifications (Include for hot applied slate granules-to act as mineral self	m²	56		
20.2.4			Supply and install water stop bar at kickers as per drawing	m	50		
20.3		PB 12	METALWORK				
20.3.1			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	3		
20.3.2			Extra over 6.6.1 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	3		
20.3.3			Supply and build in Industrial windows type BLU, 2100 x 600mm with pressed steel louvres and galvanised vermin proof mesh on the inside	No	10		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 20: SUPERSTRUCTURE

C. 85

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 21: RETURN ACTIVATED SLUDGE PUMPSTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 21: RETURN ACTIVATED SLUDGE PUMPSTATION				
		PSHA3	STRUCTURAL STEELWORK				
21.1		SANS 1200 HA	STEELWORK (Sundry Items)				
21.1.1			Mentis handrail, ball type MT 90 complete installed	m	18		
21.1.2			Mentis stair threads, 900 x 245 mm, 6 per stair	No	2		
21.1.3			Cast iron manhole covers & frames	No	4		
21.1.4			a) 450 x 600	No	6		
21.1.5			b) 600 x 900	No	2		
21.1.6			c) Grid floor, bearer 25 x 4.5 mm light duty, 450 mm wide, galvanized & banded over canals	m	45		
21.2			STEEL TANK REFURBISHMENT				
21.2.1			Allowance for removal of a debris from tank and general cleaning	Sum	1		
21.2.2			High-pressure water jetting (5000+ PSI) of internal and external surfaces	m²	200		
21.2.3			Sand blast and recoat with preimer and two compound epoxy paint.	m²	200		
21.2.4			Stainless steel SCH304 support beams, width = 100mm	m	13		
21.2.5			Allowance for removal existing pipework, pumps, etc and transportation to HGDM storages	Sum	1		
21.2.6			Internal lining with potable-grade or heavy-duty bitumen/epoxy coating	m²	200		
21.2.7			Supply and install pipe support as per detail	No	4		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 21: RETURN ACTIVATED SLUDGE PUMPSTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
		8.2.5	PIPE FITTINGS Stainless Steel				
			Copon coated = Cc; Galvanised = gs; oef=one end flanged; bef = both ends flanged; pf=puddle flange pipework 304L SS, class Sch 10. Flanges SABS 1123 table 1000/3				
21.3			SHORT RADUIS BENDS (Flanged 1000/3)				
			a) 90°				
21.3.1			150 mm dia bef	No	14		
21.4.1			a) 150mm x 50mm Eccentric Reducer	No	6		
21.4.2			b) 150mm x 50mm Concentric Reducer	No	6		
			150 mm dia straight pipe				
21.4.3			a) L=300, bef with BSP slot, Pf	No	6		
21.4.4			b) L=300, oef	No	6		
21.4.5			c) L=1500, bef	No	6		
21.4.6			d) L=1950, bef,Pf with BSP slot, Pf	No	6		
21.4.7			e) L=300, oef	No	6		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 21: RETURN ACTIVATED SLUDGE PUMPSTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			150 mm Ø NB				
21.4.8			a) RSV Gate valve class 10, BEF	No	10		
21.4.9			b) Flange adapter VJ or Simlair	No	2		
21.4.10			c) Pipe flared on one end and other flanged	No	5		
21.5			PIPE SPECIALS				
21.5.1			a) Allowance for pressure gauge with BSP	Sum	6		
21.5.2			b) Supply and install magnetic flow meters including all fixtures	No	2		
21.5.3			c) Supply and install Level sensor at tank sump	No	4		
21.5.4			d) Supply and install bleed line below pump off liquid level as per drawing	No	6		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 21: RETURN ACTIVATED SLUDGE PUMPSTATION

TOTAL CARRIED FORWARD TO SUMMARY

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 22: BUILDING REFURBISHMENT				
22.1			BUILDING 1 REFURBISHMENT				
			a) Roof coverings				
22.1.1			Ex. Fibre cement roof to be waterproofed where leaking.	m²	34		
			Prepare and paint with roof paint				
			Paintwork				
22.1.2			Supply and install 225x15mm Tempered fascia, fixed to tilter batten.The installation included removal and disposal of existing	m	13		
22.1.3			Supply and install 80x200mm Tempered bargeboard, including fixing to roof gable end. The installation included removal and disposal of existing	m	11		
22.1.4			Supply and install 75 mm Diameter rainwater pipe inclusive of fixing material	m	6		
			b) Ceiling				
22.1.5			Supply and install 4mm Nutek or similar approved ceiling board, fixed to 38x38mm battens at max. 400mm c/c. Rate to include battens.	m²	25		
22.1.6			Supply and install 75mm Coved Nu-cornice or similar approved applied to manufacturer's specifications.	m	30		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.1.7			Plaster to all internal walls, including reveals etc.	m²	55		
			Paintwork				
			Prepare and paint one coat timber undercoat and two coats 'Plascon' Velvagio or similar approved Polyurethane Enamel on:				
22.1.8			Plaster to all external walls, including reveals etc.	m²	55		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			d) Floor				
			Tiling Prepare floor surfaces and lay floor tile in accordance with suppliers specification.				
			400 x 400mm Johnson or similar approved ceramic tiles fixed with adhesive and with 8mm joints in both directions and flush pointed with tinted waterproof jointing compound and sealed as per manufacturer's specifications (colour to be confirmed by client or client's agent)				
22.1.9			Supply and install Tiling on floors inclusive of removal of existing, tile fix, grout and other items	m²	25		
			e) Door				
			g) General Provisions				
22.1.13			Sum for refurbishment and servicing for all Fire extinguisher equipment	Sum	1		
22.1.14			Sum for refurbishment and servicing of air conditioning system replaced	Sum	1		
22.1.15			Sum for refurbishment and servicing of electrical fittings	Sum	1		
22.1.16			Sum for refurbishment and servicing of burglar guards and gate	Sum	1		
22.1.17			Sum for refurbishment and servicing of window glazing. To replaced where necessary	Sum	1		
22.2			BUILDING 2 REFURBISHMENT				
			a) Roof coverings				
22.2.1			Ex. Fibre cement roof to be waterproofed where leaking.	m²	68.4		
22.2.2			Supply and install 75 mm Diameter rainwater pipe inclusive of fixing material	m	2.7		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			b) Ceiling				
22.2.3			Prepare and paint sofit	m²	68.4		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.2.4			Plaster to all internal walls, including reveals etc.	m²	133		
22.2.5			Plaster to all external walls, including reveals etc.	m²	8.5		
			Prepare and paint one coat timber undercoat and two coats 'Plascon' Velvagro or similar approved Polyurethane Enamel on:				
22.2.6			Paintwork	m²	141.5		
			d) Window				
22.2.7			Remove and make good for new 1460mmx1520mm window	No	1		
			e) Floor				
			Tiling Prepare floor surfaces and lay floor tile in accordance with suppliers specification.				
			400 x 400mm Johnson or similar approved ceramic tiles fixed with adhesive and with 8mm joints in both directions and flush pointed with tinted waterproof jointing compound and sealed as per manufacturer's specifications (colour to be confirmed by client or client's agent)				
22.2.8			Supply and install Tiling on floors inclusive of removal of existing, tile fix, grout and other items	m²	30.6		
			f) Door				
22.2.9			2032x813x40mm Timber Door, hung to timber frame	No	3		
22.2.10			Supply and install Frame for 813mm wide x 2032mm high door	No	3		
			g) Plumbing				
22.2.11			Existing gyser to be serviced and checked by plumber	No	1		
22.2.12			New 1000mm x 2000mm aluminum slidind shower door	No	1		
22.2.13			New water supply pipe for fire hose reel to be installed	No	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			h) General Provisions				
22.2.14			Sum for refurbishment and servicing for all Fire extinguisher equipment	Sum	1		
22.2.15			Sum for refurbishment and servicing of air conditioning system replaced	Sum	1		
22.2.16			Sum for refurbishment and servicing of electrical fittings	Sum	1		
22.2.17			Sum for refurbishment and servicing of burlier guards and gate	Sum	1		
22.2.18			Sum for refurbishment and servicing of window glazing. To replaced where neccessary	Sum	1		
22.3			BUILDING 3 REFURBISHMENT				
			a) Roof coverings				
22.3.1			Ex. Fibre cement roof to be waterproofed where leaking.	m²	59		
			b) Ceiling				
22.3.2			Prepare and paint sofit	m²	59		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.3.3			Plaster to all internal walls, including reveals etc.	m²	75		
22.3.4			Plaster to all external walls, including reveals etc.	m²	7.4		
			Prepare and paint one coat timber undercoat and two coats 'Plascon' Velvagio or similar approved Polyurethane Enamel on:				
22.3.5			Paintwork	m²	82.4		
			d) Floor				
22.3.6			New floor epoxy to be applied	m²	38.4		
			e) General Provisions				
22.3.7			Sum for refurbishment and servicing for all Fire extinguisher equipment	Sum	1		
22.3.8			Sum for refurbishment and servicing of electrical fittings	Sum	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
22.3.9			Roller shutter door pulley mechanism to be serviced	Sum	1		
22.3.10			Sum for refurbishment and servicing of window glazing. To replaced where necessary	Sum	1		
22.4			BUILDING 4 REFURBISHMENT				
			a) Roof coverings				
22.4.1			Ex. Fibre cement roof to be waterproofed where leaking.	m²	57.4		
			b) Ceiling				
22.4.2			Prepare and paint sofit	m²	57.4		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.4.3			Plaster to all internal walls, including reveals etc.	m²	167		
22.4.4			Plaster to all external walls, including reveals etc.	m²	7.6		
			Prepare and paint one coat timber undercoat and two coats 'Plascon' Velvagro or similar approved Polyurethane Enamel on:				
22.4.5			Paintwork	m²	174.6		
22.4.6			115x 85mm bam wall @ shower to be tiled	Sum	1		
			d) Window				
22.4.7			Replace cracked window glazing where necessary	Sum	1		
			e) Floor				
22.4.8			Tiling to be pressure cleaned and re-grouted where necessary	m²	36.5		
			f) Door				
22.4.9			Semi solid doors at showers and change room divisions to be painted	No	3		
22.4.10			All necessary hinges and door handles	No	3		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			g) Plumbing				
22.4.11			Install new shower heads and tabs for both showers	No	2		
22.4.12			Service or replace solar geyser system	No	1		
			h) General Provisions				
22.4.13			Sum for refurbishment and servicing for all Fire extinguisher equipment	Sum	1		
22.4.14			Sum for refurbishment and servicing of electrical fittings	Sum	1		
22.5			BUILDING 5 REFURBISHMENT				
			a) Roof coverings				
22.5.1			Ex. Fibre concrete roof tiles to be waterproofed where leaking.	m²	124		
22.5.2			Supply and install 80x200mm Cement bargeboard, including fixing to roof gable end. The installation included removal and disposal of existing	m	3.8		
			b) Ceiling				
22.5.3			Supply and install 4mm Nuteq or similar approved ceiling board, fixed to 38x38mm battens at max. 400mm c/c. Rate to include battens.	m²	82		
22.5.4			Supply and install 75mm Coved Nu-comice or similar approved applied to manufacturer's specifications.	m	50		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.5.5			Plaster to all internal walls, including reveals etc.	m²	167		
22.5.6			Plaster to all external walls, including reveals etc.	m²	7.6		
			Prepare and paint one coat timber undercoat and two coats 'Plascon' Velvagio or similar approved Polyurethane Enamel on:				
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
22.5.7			Paintwork	m²	175		
22.5.8			115x 85mm barn wall @ shower to be tiled	Sum	1		
			d) Window				
22.5.9			Replace cracked window glazing where necessary	Sum	1		
22.5.10			Replace or fix window mechanism for kitchen	Sum	1		
			e) Floor				
22.5.11			Tiling to be pressure cleaned and re-grouted where necessary	m²	58		
			400 x 400mm Johnson or similar approved ceramic tiles fixed with adhesive and with 8mm joints in both directions and flush pointed with tinted waterproof jointing compound and sealed as per manufacturer's specifications (colour to be confirmed by client or client's agent)				
22.5.12			Existing floor tiles at kitchen to be replaced	m²	24		
			f) Door				
22.5.13			All showers and washing closets to be installed with new locks and handles	No	9		
			g) Plumbing				
22.5.14			Install new shower heads and tabs for both showers	No	3		
22.5.15			Service or replace solar geyser system	No	1		
22.5.16			New wall mounted taps for WHB to be installed at change room 1 with all plumbing	No	1		
22.5.17			New stainless steel double sink, wall mounted tap and all plumbing to be installed at kitchen.	No	1		
22.5.18			New WHB waste pipe for change room 2 to be installed	No	1		
			h) General Provisions				
22.5.19			Sum for refurbishment and servicing for all Fire extinguisher equipment	Sum	1		
22.5.20			Sum for refurbishment and servicing of electrical fittings	Sum	1		
22.5.21			New fire extinguisher to be installed at the kitchen	No	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
22.6			BUILDING 6 REFURBISHMENT				
			a) Roof coverings				
22.6.1			Ex. Fibre concrete roof tiles to be waterproofed where leaking.	m²	124		
22.6.2			Supply and install 80x200mm Cement bargeboard, including fixing to roof gable end. The installation included removal and disposal of existing	m	3.8		
			b) Ceiling				
22.6.3			Supply and install 4mm Nutec or similar approved ceiling board, fixed to 38x38mm battens at max. 400mm c/c. Rate to include battens.	m²	82		
22.6.4			Supply and install 75mm Coved Nu-comice or similar approved applied to manufacturer's specifications.	m	21		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.6.5			Plaster to all internal walls, including reveals etc.	m²	167		
22.6.6			Plaster to all external walls, including reveals etc.	m²	7.6		
			Prepare and paint one coat timber undercoat and two coats 'Plascon' Velvago or similar approved Polyurethane Enamel on:				
22.6.7			Paintwork	m²	174.6		
22.6.8			115x 85mm barn wall @ shower to be tiled	Sum	1		
			d) Window				
22.6.9			Replace cracked window glazing where necessary	Sum	1		
22.6.10			Replace or fix window mechanism for kitchen	Sum	1		
			e) Floor				
22.6.11			Tiling to be pressure cleaned and re-grouted where necessary	m²	58		
			400 x 400mm Johnson or similar approved ceramic tiles fixed with adhesive and with 8mm joints in both directions and flush pointed with tinted waterproof jointing compound and sealed as per manufacturer's specifications (colour to be confirmed by client or client's agent)				
22.6.12			Existing floor tiles at kitchen to be replaced	m²	24		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

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SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			f) Door				
22.6.13			All showers and washing closets to be installed with new locks and handles	No	9		
			g) Plumbing				
22.6.14			Install new shower heads and tabs for both showers	No	3		
22.6.15			Service or replace solar geyser system	No	1		
22.6.16			New wall mounted taps for WHB to be installed at change room 1 with all plumbing	No	1		
22.6.17			New stainless steel double sink, wall mounted tap and all plumbing to be installed at kitchen.	No	1		
22.6.18			New WHB waste pipe for change room 2 to be installed	No	1		
			h) General Provisions				
22.6.19			Sum for refurbishment and servicing for all Fire extinguisher equipment	Sum	1		
22.6.20			Sum for refurbishment and servicing of electrical fittings	Sum	1		
22.6.21			New fire extinguisher to be installed at the kitchen	No	1		
22.7			BUILDING 7 REFURBISHMENT				
			a) Roof coverings				
22.7.1			Ex. Fibre cement roof tiles to be removed and replaced with new	m²	255		
			b) Ceiling				
22.7.2			Supply and install 4mm Nutec or similar approved ceiling board, fixed to 38x38mm battens at max. 400mm c/c. Rate to include battens.	m²	255		
22.7.3			Supply and install 75mm Coved Nu-cornice or similar approved applied to manufacturer's specifications.	m	65		
			c) Walls				
			External plaster. 15mm thick 1:4 Cement plaster finished with steel trowel to smooth and even surface on concrete blockwork:				
22.7.4			Plaster to all internal walls, including reveals etc.	m²	30		
22.7.5			Plaster to all external walls, including reveals etc.	m²	30		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

TOTAL CARRIED FORWARD TO SUMMARY	
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CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
22.8			Steel Lockers1-door factory lockers (Mild steel, powder-coated)1800 x 450 x 300mm	No	6		
22.9			Wooden BenchesSpecialist Meranti/Hardwood slats on steel frame2000 x 400 x 450mm	No	2		
22.10			Open LockersBuilt-in 16mm White Melamine (18 compartments)Custom (As per drawing)	No	1		
22.11			Wall MirrorsCommercial grade polished edge (6mm)1200 x 900mm	No	2		
22.12			Coat HooksHeavy-duty stainless steel (Double prong)	No	12		
22.13			Waste Bins45L Stainless steel pedal bins	No	2		
22.14			Seating (Extra)Low ottoman/stool (Optional for corner)450mm Dia	No	1		
22.15			Melamine Boards16mm White Melamine + Edging (for open lockers)	Sum	1		
22.16			HardwareFixings, wall anchors, and assembly consumables	Sum	1		
22.17			Signage"Change Room" door sign & hygiene notices	Sum	1		
22.18			Professional Installation Team of 2 for 2 days (Lockers, benches, mirror mounting)	Sum	1		
22.19			Specialist Carpentry On-site assembly of melamine open locker system	Sum	1		
22.20			Site supervision and quality control	Sum	1		
22.21			Granite Countertops50mm Grey Granite (Custom thickness) for main desks and sink area.	m	7.5		
22.22			Full Height Cupboard16mm White Melamine with internal shelving (as per Section B-B).	No	1		
22.23			Built-in Shelves16mm White Melamine units above granite tops.	No	2		
22.24			Steel Support StructureMatt Black Aluminium/Steel stands and support legs (Section C-C).	No	1		
22.25			Franke Cascade SinkCDX 671 Stainless Steel Inset Sink (1360x500mm).	No	1		
22.26			Cobra Ledimo MixerWall-type sink mixer with aerated swivel outlet.	No	1		
22.27			Notice BoardParrot Products ribbed aluminium frame (1200x900mm).	No	1		
22.28			Electrical PointsECO Switch socket double (4x4 White) - supply and install.	No	6		
TOTAL CARRIED FORWARD TO SUMMARY							

SECTION: SCHEDULE 22: BUILDING REFURBISHMENT

TOTAL CARRIED FORWARD TO SUMMARY				
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CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 23: BOUNDARY WALL

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 23: BOUNDARY WALL				
23.1			SITE CLEARANCE: EXTERNAL				
23.1.1		8.2.1	Clear and grub	ha	0.25		
		8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
23.1.2			a) Over 1m and up to and including 2m	No	35		
23.1.3			b) Over 2m and up to and including 3m	No	18		
23.1.4			c) Over 3m, in steps of 1m	No	18		
23.1.5		8.2.3	Remove and grub all trees and tree stumps regardless of girth	ha	0.25		
23.1.6		8.2.9	Transport material and debris to unspecified sites and dump	m3.km	3500		
23.1.7		8.2.10	Remove topsoil to nominal depth of 150mm and stockpile	m3	2500		
		8.3.2	Bulk Excavation				
23.1.8			a) Excavation between depths of 0-1m	m3	172		
23.1.9			b) Excavation between depths of 1-2m	m3	172		
			c) Extra-Over for				
23.1.10			i) Intermediate material	m3	138		
23.1.11			ii) Hard rock material	m3	103		
23.1.12			iii) Boulder Excavation, Class A	m3	17		
23.1.13			iv) Boulder Excavation, Class B	m3	17		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 23: BOUNDARY WALL

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
23.2			REINFORCED CONCRETE				
			15MPa/19mm Concrete				
23.2.1			a)Blinding for foundation 50mm	m3	25		
			25MPa/19mm Concrete				
23.3			SUPERSTRUCTURE				
			Concrete block wall				
23.3.1			190mm thick block wall -7MPa SABS approved m190 concrete blocks set in class ii mortar. galvanized brickforce at 400mm vertical centres (every 2nd block course).	m2	2208		
			BRICK REINFORCEMENT				
23.3.2			Brickforce @ 400 centres on every second course	m	4095		
			BRICKWORK SUNDRIES				
23.3.3			10mm Wide open (unfilled) tied control joint at face of pier at max 12m centres concertina ties built into the concrete filled block cores at 400mm vertical centres	m	273		
			PLASTERING				
			EXTERNAL PLASTER				
			Two coat special plaster on brickwork				
23.3.4			a) Brick wall	m2	4417		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 23: BOUNDARY WALL

TOTAL CARRIED FORWARD TO SUMMARY	
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SECTION: SECTION 24: DEWATERING PRESS

TOTAL CARRIED FORWARD			
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SECTION: SECTION 24: DEWATERING PRESS

TOTAL CARRIED FORWARD TO SUMMARY	
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CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 25: BLOWER ROOM

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 25: BLOWER ROOM				
		PSHA3	STRUCTURAL STEELWORK				
25.1		SANS 1200 HA	STEELWORK (Sundry Items)				
25.1.1			Mentis handrail, ball type MT 90 complete installed.Stainless steel 316L SS SCH 10	m	20		
25.1.2			Mentis stair threads, 900 x 245 mm, 6 per stair	No	2		
25.1.3			Cast iron manhole covers & frames	No	1		
25.1.4			a) 450 x 600	No	1		
25.1.5			b) 600 x 900	No	1		
25.1.6			c) Grid floor, bearer 25 x 4.5 mm light duty, 450 mm wide, galvanized & banded over canals	m	16		
25.1.7			Supply and install pipe support as per detail	No	3		
25.2		PB 12	METALWORK				
25.2.1			D.V. steel door frame and double steel door, to special made to existing size fully louvred Type M, complete with suitable 3 lever lockset built into walls with galvanised vermin proof mesh on the inside. Shop drawings will provided by contractor prior to manufacturing	No	1		
25.2.2			Extra over 6.6.1 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		
25.2.3			Supply and build in Industrial windows type BLU, 2100 x 600mm with pressed steel louvres and galvanised vermin proof mesh on the inside	No	3		
25.2.4			Supply install 4.0 tonne push/pull beam crawl to suit crawl beam, complete with hand chain block.	No	1		
25.2.5			Allowance for all building refurbishment of floor, roof slab and general repairs	Prov Sum	1	R 60 000.00	R 60 000.00
25.2.6			Allowance for profil on above item	%	R 60 000.00		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 25: BLOWER ROOM

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
25.3		8.2.5	PIPE FITTINGS Steel- POSTIVE BLOWER				
			Copon coated = Cc; Galvanised = gs; oef=one end flanged; bef = both ends flanged; pf=puddle flange pipework 316L SS, class Sch 10. Flanges SABS 1123 table 1000/3				
			SHORT RADUIS BENDS (Flanged 1000/3) Supply and install fittings below including all fixures				
			a) 90°				
25.3.1			350 mm dia bef	No	3		
			d) 200 mm dia (mm)				
25.3.5			L=295, bef	No	3		
25.4			e) 200 mm Ø NB, Supply and install fittings below including all fixures				
25.4.1			a) RSV Gate valve class 10, BEF for airflow applications	No	3		
25.4.2			b) Check Rite non return valve or simlair approved for airflow applications	No	3		
25.4.3			c) Flange adapter VJ or Simlair	No	3		
25.4.4			d) Bellows coupling BEF airflow applications	No	3		
25.4.5			e) Allowance for pressure gauge with BSP	Sum	3		
25.4.6			f) Air blowout valve				
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 25: BLOWER ROOM

[illegible]

SECTION: SCHEDULE 26: RETAINING WALL

[illegible]

SECTION: SCHEDULE 27: CHLORINE DOSING

[illegible]

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER UGU-07-1734-2026
SECTION: SCHEDULE 27: CHLORINE DOSING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
27.2			METALWORK				
27.2.1			Supply, fabricate and deliver Parallel Flange Channel, 120x55mm	m	9.5		
27.2.2			Supply, fabricate and deliver I-Beam IPE Section, 120x64mm	m	1.3		
27.2.3			Supply, fabricate and deliver Lipped Channel, 100x75x20x3mm	m	6.3		
27.2.4			Supply, fabricate and deliver Square Hollow Section Post, 70x70x3mm	m	6		
27.2.10			Supply and fabricate Steel Post Cap Plate, 140x140x10mm	No	3		
27.2.11			Supply and fabricate 1m high steel handrailing	m	5.6		
27.2.12			Supply and deliver Mentis Fibreglass Rectagrid, 38mm thick	m²	5.9		
27.2.13			Supply and deliver Mentis Fibreglass Stair Treads, 800x250mm (Assumed 8 No.)	No	8		
27.2.14			Supply 16mmØ 316SS Threaded Nuts & Bolts	No	38		
27.2.15			Supply 12mmØ 316SS Anchor Bolts c/w epoxy grout	No	12		
27.2.16			Allow for fabrication, welding and preparation of shop drawings	Sum	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 27: CHLORINE DOSING

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
27.3		8.2.5	PIPE FITTINGS Stainless Steel				
			Copon coated = Cc; Galvanised = gs; oef=one end flanged; bef = both ends flanged; pf=puddle flange pipework 304L SS, class Sch 10. Flanges SABS 1123 table 1000/3				
			SHORT RADUIS BENDS (Flanged 1000/3)				
			a) 90°				
27.3.1			150 mm dia bef	No	14		
			b) 45°				
27.3.2			350 mm dia oef with duck flange	No	2		
			c) TEE PIECE WITH LATERAL OF ANGLE = 60°				
27.3.3			150 x 150mm	No	2		
			REDUCER				
27.3.4			a) 350mm x 630mm expander with 350mm straight pipe	No	1		
27.3.5			b) 150mm x 50mm Concentric Reducer	No	1		
			150 mm dia straight pipe				
27.3.6			a) L=300, bef with BSP slot, Pf	No	1		
27.3.7			b) L=300, oef	No	1		
			350 mm dia straight pipe				
27.3.8			a) L=700, bef,Pf	No	1		
			Flange adapter	No	1		
27.3.9			a) RSV gate valve	No	1		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION				
28.1			LIGHTNING PROTECTION				
			Supply and install the lightning protection and earthing installation for all the WWTW Buildings & Structures for TT1 & TT2 as follows :				
28.1.1			a) Carry out the earth resistivity survey and provide report for all the buildings on site (include for recommendation for number and spacings of earth electrodes)	Sum	1		
28.1.2			b) Excavation and backfill of ground 300 wide and 600 deep in all classes of medium to hard pickable ground	m	200		
28.1.3			c) 70mm ² bare copper ground trench earth ring main	m	200		
28.1.4			d) 1.6 - 2m long copper clad earth electrodes	No.	30		
28.1.5			e) Exothermic welds 70 -70mm ²	No.	40		
28.1.6			f) Denso tape of exothermic welds	No.	40		
28.1.7			g) 70mm ² PVC insulated earth conductor built into brickwork to pick up roof conductors or steel members, columns etc	m	160		
28.1.8			h) 25 Ø PVC conduit flush cast in slabs and chased in brickwork	m	160		
28.1.9			i) 10 dia solid aluminium earth terminal conductor saddled to concrete roof or walls or upstand beams	m	80		
28.1.10			j) 70 mm ² PVC insulated earth conductor bonding to steel staircases, hand railing etc.	m	30		
28.1.11			k) Tap and drill steel columns to receive 70 mm ² earth conductors from earth mat	No.	8		
28.1.12			l) 70mm ² PVC insulated earth conductor for connecting to reinforcing steel in roof or connecting onto structural steel trusses or sheeting	m	120		
28.1.13			m) 70mm ² earth terminals including making off with lugs etc. complete	No.	50		
28.1.14			n) Supply and install 300mm long copper earth bar with stand-off insulators adjacent MCC	Sum	7		
28.1.15			o) Ensure earth continuity and test between the structure and to the earth mat for all buildings	Sum	1		
28.1.16			p) Ensure earth continuity and test between the concrete or steel roof and earth mat and to other above structures and buildings for all buildings	Sum	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.1.17			q) Test and commission the Lightning Protection and Earthing system for all the buildings and structures in presence of the Engineer	Sum	1		
28.1.18			r) Issue the earth test and compliance certificates for all the above Buildings and Structures (separate certificates required for each site - 8 in total)	Sum	1		
28.1.19			s) Issue the "as built" earthing layouts and hand-over data packs for all the above structures and buildings	Sum	1		
28.2			LEVEL SENSOR , SWITCHES & SENSOR CABLING Etc.				
28.2.1			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	Sum	8		
28.2.7			g) Limit switch AC/DC or similar approved	No	3		Rate Only
28.2.8			h) Dissolved Oxygen Sensors (DO Sensors) with s/steel mounting brackets and WP enclosure	No	4		
28.2.9			i) Blower air pressure sensors installed on the air delivery pipe with sockets and all fittings complete	No	1		
28.2.10			j) Modbus cabling between the MCC PLCs and SCADA switch at control room (armoured in ground)	m	300		
28.2.11			k) Termination of modbus or fibre optic cabling including termination kit , splicing etc	No.	4		
28.2.12			l) CAT 6 Ethernet cable 1,5mm² 4 pair screened cable	m	400		
28.2.13			m) Termination of ethernet cable	No	16		
28.2.14			n) Fibre optic cable 8 pair single mode	m	450		
28.2.15			o) Fibre optic cable terminations , splicings etc	No	16		
28.2.16			p) Connect , interface , programme , test and commission the PLC for the above level sensor , instruments and control systems and interface to SCADA system complete	Sum	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.2.17			q) Stainless steel level electrodes as specified for control of pumps (auto start and stop)	No	6		
28.3			FLOW METERS				
28.3.1			Supply and deliver to site the following flow meters :				
28.3.1.1			a) 400 dia mag flow meter as specified on RAS pumping line	Sum	2		
28.3.1.2			b) 250 dia mag flow meter as specified on the WAS pumping line	Sum	3		
28.3.1.3			c) Blower air flow meters installed on the blower delivery pipe with sockets and all fittings complete	No	1		
28.3.2			Install and connect up the flow meters supplied above as follows :				
28.3.2.1			a) 400 dia mag flow meter as specified on RAS pumping line	Sum	2		
28.3.2.2			b) 250 dia mag flow meter as specified on the WAS pumping line	Sum	3		
28.3.2.3			c) Blower air flow meters installed on the blower delivery pipe (NB 300-350mm pipe) with sockets and all fittings complete	No	1		
28.4			CABLES				
28.4.1			a) Supply Cables PVC/SWA/PVC/ECC cables per SANS 1507				
28.4.1.1			(a) 1,5mm ² x 3 core ECC	m	150		
28.4.1.2			(b) 1,5mm ² x 4 core ECC	m	150		
28.4.1.3			(c) 2,5mm ² x 3 core ECC	m	200		
28.4.1.4			(d) 2,5mm ² x 4 core ECC	m	200		
28.4.1.5			(e) 10mm ² x 3 core ECC	m	225		
28.4.1.6			(f) 16mm ² x 4 core ECC	m	130		
28.4.1.7			(g) 16mm ² x 3 core ECC	m	120		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.4.1.8			(h) 25mm ² x 4 core ECC	m	110		
28.4.1.9			(i) 35mm ² x 4 core ECC	m	200		
28.4.1.10			(j) 95mm ² x 4 core ECC	m	80		
28.4.1.11			(k) 240mm ² x 4 core ECC	m	75		
28.4.2			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 Corruguard glands, shrouds, lugs and cable numbers.				
28.4.2.1			(a) 1,5mm ² x 3 core ECC	No	50		
28.4.2.2			(b) 1,5mm ² x 4 core ECC	No	50		
28.4.2.3			(c) 2,5mm ² x 3 core ECC	No	50		
28.4.2.4			(d) 2,5mm ² x 4 core ECC	No	20		
28.4.2.5			(e) 10mm ² x 3 core ECC	No	30		
28.4.2.6			(f) 16mm ² x 4 core ECC	No	6		
28.4.2.7			(g) 16mm ² x 3 core ECC	No	16		
28.4.2.8			(h) 25mm ² x 4 core ECC	No	8		
28.4.2.9			(i) 35mm ² x 4 core ECC	No	12		
28.4.2.10			(j) 95mm ² x 4 core ECC	No	2		
28.4.2.11			(k) 240mm ² x 4 core ECC	No	12		
28.5			ISOLATORS FOR PLANT, DOSING & OTHER EQUIPMENT				
28.5.1			Supply, installation and connection of isolator in IP65 slide extension box complete with box				
28.5.1.1			a) 20 Amp 3 pole Hazardous (Ex Rated)	No.	4		
28.5.1.2			b) 30 Amp 3 pole Hazardous (Ex Rated)	No.	2		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.5.1.3			c) Stop button + Stand Hazardous (Ex Rated)	No.	6		
28.5.1.4			d) 20 Amp 2 pole	No.	6		
28.5.1.5			e) 20 Amp 3 pole	No.	6		
28.5.1.6			f) 30 Amp 3 pole	No.	4		
28.5.1.7			g) Emergency Stop buttons + stands corrosion proof s/steel	No.	18		
28.5.2			Make safe , disconnect , remove and deliver to UGU Stores the following :				
28.5.2.1			a) Existing faulty and light fittings not working	No	30		
28.5.2.2			b) Existing plug, isolators or other power points	No	30		
28.5.2.3			c) Existing conduit and wiring (all sizes)	m	150		
28.5.2.4			d) Cables , cable ends, cable trays etc complete (all sizes)	m	80		
28.5.2.4			Allow a provisional sum for the Eskom or Municipality power supply upgrade or new supplies to the WWTW site/s (note that this amount is an estimate only, the final amount will depend on the quote received after the application is made)	Prov Sum	1	R 1 500 000.00	R 1 500 000.00
28.5.2.4			Allow for profit on the item 28.5.24	%	R 1 500 000.00		
28.6			LIGHTING, SMALL POWER & SOCKET INSTALLATION				
28.6.1			EQUIPMENT				
28.6.1.1			a) Surface 1 lever light switch	No.	12		
28.6.1.2			b) Surface 16A Switched socket outlet	No.	12		
28.6.1.3			c) 16A Switched socked outlet industrial type surface corrosion proof	No.	8		
28.6.1.4			d) 16 Amp weatherproof switched socket outlet	No.	4		
28.6.1.5			e) Weatherproof termination / junction boxes - CCG corrosion proof or similar for sensors and instruments with terminals	No.	24		
28.6.1.6			f) Surface 2 way light switch	No.	8		
28.6.1.7			g) 20A DP 2 pole isolators	No.	8		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.6.1.8			h) 16 Amp zone 2 EXE rated 16A switched socket outlet	No.	4		
28.6.1.9			i) Zone 2 EXE rated terminal junction box	No.	16		
28.6.1.10			j) DBs for all pump stations and other treatment plant buildings as specified	No.	5		
28.6.1.11			k) Conduits , fittings , wiring, saddles , accessories etc complete for all the structures and building lighting and power points				
28.6.1.11.1			i) 25 dia PVC conduit	m	120		
28.6.1.11.2			ii) 25 dia galvanised conduit	m	100		
28.6.1.11.3			iii) 25 dia galvanised round boxes with covers	m	20		
28.6.1.11.4			iv) 100 x 50 galvanised box with covers	m	20		
28.6.1.11.5			v) 100 x 100 galvanised box with cover	No.	2		
28.6.1.11.6			vi) 32 dia PVC conduit in floor and surface with bends etc	m	60		
28.6.1.11.7			vii) 1,5mm ² wires	No.	400		
28.6.1.11.8			viii) 2,5mm ² wires	m	380		
28.6.1.11.9			viii) 4mm ² wires	m	150		
28.6.1.11.10			x) 40 x 40 galvanised trunking with covers fixed to wall or suspended from roof or trusses etc	m	120		
28.6.2			Supply light fittings / luminaries and poles as specified with lamps (refer to project specification for details)				
28.6.2.1			a) Type A - 1,5m 2 Tube 2 X 30W LED corrosion proof	No.	30		
28.6.2.2			b) Type B - Surface Bulkhead Aluminium with glass bowl 1 x 18W LED	No.	24		
28.6.2.3			c) Type C - 1,5m 2 Tube 2 x 30W LED EXE Rated Zone 2	No.	10		
28.6.2.4			d) Type D - Floodlight with aluminium body 1 x 100W LED	No.	4		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.6.3			Install and connect the light fittings and poles supplied above.				R -
28.6.3.1			a) Type A	No.	30		
28.6.3.2			b) Type B	No.	24		
28.6.3.3			c) Type C	No.	10		
28.6.3.4			d) Type D	No	4		
28.6.4			Supply and install photo cell to control outside lights	No	4		
28.6.5			Weatherproof termination boxes for instruments etc (with DIN rail, terminals etc.)	No	6		
28.6.6			Disconnect , make safe , strip , remove and deliver the existing damaged or non-compliant MCCs on site and deliver to UGU Stores	No	6		
28.7			MCC & DISTRIBUTION BOARDS				
28.7.1			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)				
28.7.1.1			a) Make safe, disconnect , remove and deliver the existing star-delta starters for the 75kW submersible pumps for Pump Station 4A	No	3		
28.7.1.2			b) Supply and install new 90kW VSDs for the new submersible pumps for Pump Station 4A	No	3		
28.7.1.3			c) Modify and integrate the controls, VSDs etc to the new PLC/HMI in existing MCC for Pump Station 4A (measured elsewhere) including all wiring and associated equipment	No	3		
28.7.1.4			d) Test and commission the VSDs and pumps for Pump Station 4A	Sum	1		
28.7.1.5			e) MCC - 05 New Blower MCC (including PLC & HMI)	Sum	1		
28.7.1.6			f) MCC - 08 New Sludge Dewatering Plant & Equipment (including PLC & HMI)	Sum	1		
28.7.1.7			g) MCC - 10 New Sludge & Recirculation Pumps and Sedimentation Tank 5 - 6 (including PLC & HMI)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			h) MCC - 11 New TT3 Inlet Works Screens & Conveyor (including PLC & HMI)	Sum	1		
28.7.2			Supply and install new PLCs as specified complete in existing MCCs and integrate to starters/VSDs and to SCADA with all control mods and wiring	No	5		
28.7.3			Supply and install HMI as specified complete in existing MCCs and integrate to PLC and SCADA with all control mods and wiring	No	5		
28.7.4			Design and submit wiring and layout 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		
28.7.5			Factory Acceptance tests (FAT) for all the above MCCs & DBs etc. supplied above including for costs for Engineer to attend	Sum	1		
28.7.6			Allow for cost of Engineer to attend FAT & SAT of MCCs as above and for Engineers travel costs to site and other venues	Sum	1	R 90 000.00	R 90 000.00
28.7.7			Allow for profit and attendance on above item	%			
28.7.6			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		
28.8			SOLAR POWER				
			Supply , deliver, install and connect up the following :				
28.8.1			a) Solar panels with frame and stand-alone supporting structure over drying beds - to power 5kW building lighting and 5kW of site street lighting (Total 10kW). Off grid system	Sum	1		
28.8.2			b) Solar batteries (lithium iron type) complete with cabling etc	Sum	1		
28.8.3			c) Solar charge controller	Sum	1		
28.8.4			d) Solar power inverter complete (Off grid system)	Sum	1		
28.8.5			e) Solar power cabling complete	Sum	1		
28.8.6			f) Solar power DB	Sum	1		
28.8.7			g) Test and commission and provide solar power O & M manuals, COC and compliance and hand over data sheets complete	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY							

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

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CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
			PLC/HMI & SCADA				
			Full package of Adroit or similar and equal approved SCADA system that will monitor and control the water treatment plant and chemical dosing systems and pumping systems. Includes computer hardware, Adroit Agent Server Version Server 8-75 Scanned Points. Rockwell compact Logix PLC Hardware in Control Room/Office Building and Interfacing Rockwell compact Logix PLC hardware in the various MCCs/Buildings. To include Programming and integration of SCADA & PLC systems.				
28.9.2			Supply , install, test and commission the full on-site SCADA system as specified	Sum	1		
28.9.3			Allow a sum for a PLC System Integrator for programming of the new PLC in all MCCs and integrating, interfacing and commissioning with new on-site SCADA at the WWTW and existing SCADA systems at UGU Control Room	Sum	1		
28.9.4			Submit the electrical COC for the entire WWTW installations for all buildings and structures	Sum	1		
28.9.5			Provide training for the Plant operations and maintenance staff for the entire WWWT installations for all buildings and structures	Sum	1		
28.10			DOCUMENTATION				
28.10.1			a) Submit As-built Electrical & Instrumentation drawings to the Engineers satisfaction where not measured elsewhere, comprising the following:	Sum	1		
			1 x full set "red line" drawings (hard copy)				
			4 x sets manufacturers and supplier schedules and drawings (hard copy + CD)				
28.10.2			Supply the O & M manuals for the electrical, instrumentation and mechanical installation as specified	Sum	1		
28.10.3			Trenching				
28.10.3.1			a) Trenching 400 wide x 550 deep in pickable to hard ground	m	210		
28.10.3.2			b) Backfilling of above trenches	m	210		
28.10.3.3			c) Cable marker tape	m	190		
28.10.3.4			d) Concrete cable markers	No	20		
TOTAL CARRIED FORWARD TO SUMMARY							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
28.10.4			Sleeves and cable accessories (supply and install)				
28.10.4.1			(a) Supply and install cable warning tape	m	190		
28.10.4.2			(b) Concrete cable markers	No	12		
28.10.4.3			(c) 110Ø uPVC cable sleeves	m	180		
28.10.4.4			(d) 110 Ø 90° PVC bends	No	2		
28.10.4.5			(e) 50Ø uPVC cable sleeves	m	40		
28.10.4.6			(f) 50 Ø 90° PVC bends	No	6		
28.10.4.7			(g) 100mm wide heavy duty galvanised heavy duty cable ladder	m	15		
28.10.4.8			(h) 200mm wide heavy duty galvanised heavy duty cable ladder	m	30		
28.10.5			AIRCON UNITS & EXTRACT FANS				
28.10.5.1			a) Luft or similar and equal approved extract fans type Luft LPA 500/43F 380Volt 2m³/s with WC500 wall cowl cladding	No.	2		
28.10.5.2			b) Create opening in brickwork and side cladding for above fan , patch up, waterproof and make good	No.	2		
28.10.5.3			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		
28.10.5.4			d) Supply and install 18000Btu/hr midwall aircooled aircon split units (Samsung or similar) including condensers, evaporators, remote control, refrigerant piping and control wiring complete (allow for 10m between units and all bluechem treatment)	No	3		
28.10.5.5			e) Connect the ventilation fans to their respective electrical isolators or power points	No.	7		
28.10.5.6			f) Test and commission the aircon units and ventilation fans supplied above	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY							

SECTION: SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION

TOTAL CARRIED FORWARD TO SUMMARY	
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CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 29 : E&M STANDBY GENERATORS AND TRANSFORMERS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
			SCHEDULE 29 : E&M STANDBY GENERATORS AND TRANSFORMERS				
29.1			STAND-BY GENERATORS & TRANSFORMER				
29.1.1			Allow an amount to disconnect, remove, transport to UGU Stores the existing generator in the generator room for Pump Station 4A	Sum	1		
29.1.2			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 :				
29.1.2.1			a) 650KVA for Margate WWTW (for all pumps , aerators, clarifiers , blowers , etc)	Sum	1		
29.1.2.2			a) 250KVA for Margate Pump Station 4A (for all pumps etc)	Sum	1		
29.1.2.3			c) Supply , deliver to site and rig into position the concrete plints for the above 2 no generators	No	2		
29.1.3			Offload and rig into positions and connect up the above two(2) off new generators	Sum	2		
29.1.4			Allow an amount of R 45 000,00 for the Engineer to attend the generator FAT (including Engineer/s time , flights, travel costs etc)	Sum	1	R 45 000.00	R 45 000.00
29.1.5			Allow for profit and attendance on above item	%	1		
29.1.6			Isolate , disconnect , remove and transport the existing 500kVA 400 Volt transformer at the WWTW site to the UGU Stores	Sum	1		
29.1.7			Design , manufacture and supply the 630kVA 11kV/0,4kV mini-sub as specified for the WWTW power upgrade	Sum	1		
29.1.8			Deliver to the site the transformer supplied above	Sum	1		
29.1.9			Off-load and rig into position the above transformer and connect up	Sum	1		
29.1.10			Provide 3000 liters of diesel for testing and commissioning of the 2 No generators	litre	2500		
29.1.11			Allow an amount to make the application to Eskom to increase the power supply to the site to 630KVA	Sum	1		
29.1.12			Allow an amount to disconnect and relocate the existing bulk electricity panel from the old electrical room to a new room to be constructed	Sum	1		
TOTAL CARRIED FORWARD							

CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 29 : E&M STANDBY GENERATORS AND TRANSFORMERS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
29.1.13			Connect up, test and commission the above new transformer	Sum	1		
29.2			CABLES				
29.2.1			Supply Cables PVC/SWA/PVC/ECC cables per SANS 1507				
29.2.1.1			(a) 1,5mm ² x 14 core ECC	m	80		
29.2.1.2			(b) 95mm ² x 4 core ECC	m	1		
29.2.3			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 Corruguard glands, shrouds, lugs and cable numbers.				
29.2.3.1			(a) 1,5mm ² x 14 core ECC	No	8		
29.2.3.2			(f) 95mm ² x 4 core ECC	No	4		
29.2.3.3			(g) 240mm ² x 4 core ECC	No	8		
			Trenching etc.				
29.2.4		SANS1200 DB, PSDB	Trenching 400 wide x 800 deep in pickable to hard ground	m	40		
29.2.5			Backfilling of above trenches	m	40		
29.2.6			Sleeves and accessories (supply and install)				
29.2.6.1			(a) Supply and install cable danger warning tape	m	40		
29.2.6.2			(b) Concrete cable markers	No.	4		
29.2.6.3			(c) 150Ø uPVC cable sleeves	m	4		
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 29 : E&M STANDBY GENERATORS AND TRANSFORMERS

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CONTRACT TITLE REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)

CONTRACT NUMBER UGU-07-1734-2026

SECTION: SCHEDULE 30 : ELECTRICAL SITE LIGHTING, GENERAL & PROV SUMS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
30			SCHEDULE 30 : ELECTRICAL SITE LIGHTING, GENERAL & PROV SUMS				
30.1			STREETLIGHTING				
30.1.1			(Fed off 10kWp solar system)				
30.1.2			Supply light fittings / luminaries and poles as specified with lamps (refer to project specification for details)				
30.1.3			All lights by TLF Lighting				
30.1.4			a) Type E - 100W LED streetlights with photocell by TLF/Beka with mounting pole brackets	No.	16		
30.1.5			b) Type F - 9,5m galvanised poles	No.	24		
30.1.6			c) Type G - 9,5m galvanised poles with back to back bracket	No.	24		
30.1.7			d) Type H - 60W LED 230V streetlight by TLF/Beka	No.	4		
30.1.8			Install and connect the light fittings and poles supplied above.				
30.1.9			a) Type E - 100W LED streetlights with photocell by TLF/Beka with mounting pole brackets	No.	16		
30.1.10			b) Type F - 9,5m galvanised poles	No.	24		
30.1.11			c) Type G - 9,5m galvanised poles with back to back bracket	No.	24		
30.1.12			d) Type H - 60W LED 230V streetlight by TLF/Beka	No.	4		
30.2			HIGH MAST LIGHTING				
30.2.1			a) Allow a provisional sum for upgrade of the existing high mast or site lighting system	Prov Sum	1	R 2 000 000.00	R 2 000 000.00
30.2.2			b) Allow a % for mark-up on 30.2.1 and attendance on above provisional sum item	%	R 2 000 000.00		
			OTHER				
TOTAL CARRIED FORWARD							

SECTION: SCHEDULE 30 : ELECTRICAL SITE LIGHTING, GENERAL & PROV SUMS

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CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER: UGU-07-1734-2026
SECTION: SCHEDULE 31: PROVISIONAL ITEMS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
31		SANS 1200A	SCHEDULE 31: PROVISIONAL ITEMS				
			DAYWORKS				
31.1		PS A 8.7	LABOUR				
			Supervision, transport etc. to be included in P&G allowance. Any other allowance to be included in the rate.				
31.1.1			a) Unskilled Labour	hr	200		
31.1.2			b) Semi-skilled Labour	hr	200		
31.1.3			c) Plumber	hr	200		
31.1.4			d) Ganger	hr	200		
31.1.5			e) Electrician	hr	200		
31.1.6			f) Foreman	hr	200		
31.2			PLANT				
31.2.1			a) Grader (CAT 140G or Similar).	hr	150		
31.2.1			b) Track Excavator (CAT 235 or similar).	hr	150		
31.2.2			c) Vibratory Roller (BOMAG 212 or Similar).	hr	150		
31.2.3			d) Pedestrian Roller(Bomag BW 90 or Similar)	hr	150		
31.2.4			e) Water Truck(5000litres)	hr	150		
31.2.5			h) Dewatering pump including generator and accessories (50mm pump, 600 l/m)	hr	150		
31.2.6			i) Water Truck(5000litres)	hr	150		
31.2.7			j) Tipper Truck(10m³)	hr	150		
31.2.8			k) Backhoe TLB (CAT 428 or equivalent).	hr	150		
31.2.9			l) Dewatering pump including generator and accessories (50mm pump, 600 l/m)	hr	150		
31.3			MATERIAL				
31.3.1			Actual cost of materials delivered to site inclusive of transport charges. (supporting invoices to be supplied)	Prov Sum	1	R 1 500 000.00	R 1 500 000.00
31.3.2			Percentage adjustment to item 31.3.1 for materials	%	1500000		
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER: UGU-07-1734-2026
SECTION: SCHEDULE 31: PROVISIONAL ITEMS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD							
31.5			STUDENT IN-SERVICE TRAINING				
31.5.1			Allowance for one Student in-service Training as provided by Client	Prov Sum	1	R 270 000.00	R 270 000.00
31.5.2			Contractor's markup on item 31.5.1	%	270000		
31.6			ENVIRONMENTAL CONTROL OFFICER				
31.6.1			Allowance for provision of an Environmental control officer (ECO)	Prov Sum	1	R 450 000.00	R 450 000.00
31.6.2			Contractor's markup on item 31.6.1	%	450000		
31.7			OCCUPATIONAL HEALTH AND SAFETY				
31.7.1			Allowance for provision of an Occupational Health and Safety Officer (OHSO)	Prov Sum	1	R 360 000.00	R 360 000.00
31.7.2			Contractor's markup on item 31.7.1	%	360000		
31.7.3			Allowance for provision of an Occupational Health and Safety Auditor	Prov Sum	1	R 270 000.00	R 270 000.00
31.7.4			Contractor's markup on item 31.7.3	%	270000		
31.8			SOCIAL FACILITATOR				
31.8.1			Allowance for provision of a Social Facilitator	Prov Sum	1	450 000.00	R 450 000.00
31.8.2			Contractor's markup on item 31.8.1	%	450000		
31.9			PROVISION FOR EPWP				
31.9.1			Extra over sub-item for branding of EPWP PPE	Sum	1	R 50 000.00	R 50 000.00
31.10			PROVISION FOR TRAINING				
31.10.1			General Skills Training	Person days of Training	30		
31.10.2		PS A 8.5 (b) 1	Allowance for CEITS skills training of local labour	Prov. Sum	1	R 800 000.00	R 800 000.00
TOTAL CARRIED FORWARD							

CONTRACT TITLE: REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)
CONTRACT NUMBER: UGU-07-1734-2026
SECTION: SCHEDULE 31: PROVISIONAL ITEMS

ITEM NO	LI	PAYMENT	DESCRIPTION	UNIT	QTY	RATE		AMOUNT
TOTAL BROUGHT FORWARD								
31.10.3		PS A 8.5 (b) 2	Handling cost and profit in respect of sub-item 31.10.1 & 31.10.2 above.	%	800000			
31.10.4			Training Venue (only if required)	Sum	1			
31.10.5			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	R	10 000.00	R 10 000.00
31.10.6			Handling cost and profit in respect of sub-item 31.10.5 above.	%	10000			
31.11			EXISTING SERVICES					
31.11.1		PS A 8.5	Allow for detection, and re-routing of existing services	Prov Sum	1	R	750 000.00	R 750 000.00
31.11.2		PS A 8.5 (c) 2	Handling cost and profit in respect of sub-item 31.11.1 above.	%	750000			
31.12			SECURITY					
31.12.1		PS A 8.5	Allow for CCTV camera istallation and other related Security Infrastructure	Prov Sum	1	R	750 000.00	R 750 000.00
31.12.2		PS A 8.5 (c) 2	Handling cost and profit in respect of sub-item 31.12.1 above.	%	750000			
31.13			CPG ALLOWANCE					
31.13.1			Provide the Provisional Sum to pay for "Enterprise Development Support" of targeted sub-contractors, on an adhoc basis at the sole discretion of the Client.	Prov Sum	1	R	1 500 000.00	R 1 500 000.00
31.13.2			Handling cost and profit in respect of sub-item 31.13.1 above.	%	1500000			
31.14			GENERAL					
			Tenderer to insert below any items which he wishes specifically to include under the Preliminary and General Section					
31.14.1			a)					
31.14.2			b)					
31.14.3			Topographic Survey	ProvSum	1	R	150 000.00	R 150 000.00
31.14.4			Handling cost and profit in respect of sub-item 31.14.3 above.	%	150000			
31.14.5			Geotechnical Investigation	ProvSum	1	R	150 000.00	R 150 000.00
31.14.6			Handling cost and profit in respect of sub-item 31.14.5 above.	%	150000			
TOTAL CARRIED FORWARD TO SUMMARY								

C2.2 BILL OF QUANTITIES

SUMMARY OF BILL OF QUANTITIES

SCHEDULE 1: GENERAL.....	R.....
SCHEDULE 2: EARTHWORKS (PIPE TRENCHES).....	R.....
SCHEDULE 3: BEDDING (PIPES).....	R.....
SCHEDULE 4: SEWERS.....	R.....
SCHEDULE 5: GABIONS AND PITCHING.....	R.....
SCHEDULE 6: PIPE JACKING	R.....
SCHEDULE 7: SEWER HOUSEHOLD CONNECTIONS.....	R.....
SCHEDULE 8: AREATION BASIN.....	R.....
SCHEDULE 9: UPPER INLET.....	R.....
SCHEDULE 10: LOWER INLET.....	R.....
SCHEDULE 11: MEDIUM PRESSURE PIPELINES.....	R.....
SCHEDULE 12: WWTW EARTHWORKS (PIPE TRENCHES).....	R.....
SCHEDULE 13: BEDDING (PIPES).....	R.....
SCHEDULE 14: SECONDARY SEDIMENTATION TANKS.....	R.....
SCHEDULE 15: CONCRETE STRUCTURAL	R.....
SCHEDULE 16: SST STRUCTURAL STEELWORK.....	R.....
SCHEDULE 17: SST MEDIUM PRESSURE PIPE LINES.....	R.....
SCHEDULE 18: ACCESS ROAD AND PARKING.....	R.....
SCHEDULE 19: CONCRETE	R.....
SCHEDULE 20: SUPERSTRUCTURE.....	R.....
SCHEDULE 21: RETURN ACTIVATED SLUDGE PUMPSTATION.....	R.....
SCHEDULE 22: BUILDING REFURBISHMENT.....	R.....
SCHEDULE 23: BOUNDARY WALL.....	R.....
SECTION 24: DEWATERING PRESS.....	R.....
SCHEDULE 25: BLOWER ROOM.....	R.....
SCHEDULE 26: RETAINING WALL.....	R.....

SCHEDULE 27: CHLORINE DOSING.....	R.....
SCHEDULE 28 : WWTW ELECTRICAL AND INSTRUMENTATION.....	R.....
SCHEDULE 29 : E&M STANDBY GENERATORS AND TRANSFORMERS.....	R.....
SCHEDULE 30 : ELECTRICAL SITE LIGHTING, GENERAL & PROV SUMS...	R.....
SCHEDULE 31: PROVISIONAL ITEMS	R.....
 SUBTOTAL 1	 R.....
 ADD CONTINGENCIES @ 10%	 R.....
 SUBTOTAL 2	 R.....
 ADD CONTRACT PRICE ADJUSTMENT @ 10%	 R.....
 SUB-TOTAL 2	 R.....
 ADD 15% VAT	 R.....
 TOTAL CARRIED TO THE FORM OF OFFER ON PAGE C.2	 R.....

SIGNED ON BEHALF OF TENDERER:

C3 SCOPE OF WORK

CONTENTS

C3.1 STANDARD SPECIFICATIONS

C3.2 CONTENTS

A : GENERAL

- PS.1 Project Description
- PS.2 Description of The Site and Access
- PS.3 Construction and Management Requirements
- PS.4 PROJECT REQUIREMENTS

B.1: 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
- PSMF SUBBASE
- PSMJ SEGMENTED PAVING
- PSMK KERBING AND CHANNELING

B.2: ADDITIONAL PARTICULAR SPECIFICATIONS

PA: SECURITY FENCING

PB: OHSA 1993: HEALTH AND SAFETY SPECIFICATION

PC: ENVIRONMENTAL MANAGEMENT SPECIFICATION

PD: EPWP REQUIREMENTS

PG: STERILISATION OF TANKS AND RESERVOIRS

Mp MECHANICAL SPECIFICATION

PS 5: ELECTRICAL SPECIFICATION

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 (Fourth 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 scope of the appointment is to urgently access and quantify the work required to refurbish the storm damaged sewer infrastructure, including damaged pumpstations, and the Margate WWTW to get to a position that the treated effluent from the works complies with the approved and specified effluent standards. Including new waterborne sewer infrastructure to Margate Ext.3.

This is including, but not limited:

- To provide household connections for all unserved formal households within the design area.
- To dredge/clean all reactors and sedimentation tanks and to refurbish the 3 (third) treatment train in sequence so that a treatment train can treat the influent wastewater to the design capacity and limit.
- Construction of new two secondary sedimentation tank and return activated sludge pumpstations. As well as access road and site security

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 an old treatment train with process design to the General Limit for effluent. Treatment train 3 that was added in ± 2010 was designed as some sort of hybrid aeration tank support process.

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 3 [3(a) & 3(b)] - (2 x fine bubble aeration basins)

- Flow measuring equipment and fixing of corroded concrete
- Emptying and cleaning of aeration basin

- Removal of aeration pipework and aeration domes from floor
- Repair concrete structure where applicable
- Repair/replace/modify outflow weir
- Modify/extend existing blower room
- Supply and install complete 5 rotary or turbo blowers with motors (37 kW)
- Supply, install, commission and test aeration pipework and aeration domes or strips
- Repair/replace corroded pipework from blower room to aeration basin
- Construct 2 x 20 m Ø sedimentation tanks
- 2 x Half bridges complete for sedimentation tanks (3CR12 steel)
- New baffle plate and V-notch weir - stainless steel plates
- New RAS pumpstation
- 3 x 7.5 kW RAS self-priming pumps
- New pipework in PS
- Provision for interlink pipework
- Oxygen probes in aeration basins with control circuitry and signal transmitting
- Provide for exposing and relaying existing pipework and electric cables

Refurbishment Applicable to All Treatment Trains

- Refurbish/replace extend chlorine dosing building and all chlorine dosing equipment to comply with all safety regulations
- Extension and additions to sludge dewatering plant
- Standby generator to keep essential items running during power failure
- Security fence fully equipped for monitoring
- Sludge thickener

Summary of Sewer Infrastructure required (Pipelines)

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

- Installing approximately 1,200m of Pipes between 355 - 250mm Ø uPVC Bulk Pipelines
- Installing approximately 2,000m 200mm Ø uPVC Bulk Pipelines
- Installing approximately 6,000m, 160mm Ø uPVC Bulk Pipelines
- Replacing approximately 16,250m, 110mm Ø uPVC Reticulation Pipelines
- Approximately 250 Sewer Household Connections

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 To- tal	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 Per- manent Employees	Turnover previous 12 months	Total per- son days to date	Amount paid to SMME	Person days lo- cally 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, grand-child 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 behaviour 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 always kept clean and neat. 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 of 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
September	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 released.

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 (SABS 1200A)

PSA 2 INTERPRETATIONS

PSA 2.3 DEFINITIONS

a) General

ADD THE FOLLOWING DEFINITIONS:

“General conditions: The General Conditions of Contract specified for use with this Contract and the special conditions of Contract as applicable.

Specified: As specified in the standardized specifications, the Drawings or the Project Specifications. Specifications shall have the corresponding meaning.”

c) Measurement and payment

REPLACE THE DEFINITIONS FOR “fixed charge”, “time-related charge” AND “value-related charge”

WITH THE FOLLOWING:

“Fixed charge: A charge that is not subject to adjustment on account of variation in the value of the Contract amount or the Contract Time of Completion.

Time-related charge: A charge, the amount of which varies in accordance with the Time for Completion of the work, adjusted in accordance with the provisions of the Contract.

Value-related charge: A charge, the amount of which varies pro rata with the final value of the measured work executed and valued in accordance with the provisions of the Contract.”

PSA 3 MATERIALS

PSA 3.1 QUALITY

ADD THE FOLLOWING:

“All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SANS Specifications shall bear the SANS mark, whether so specified or not.”

ADD THE FOLLOWING SUB-CLAUSE:

PSA 3.3 ORDERING OF MATERIALS

The quantities set out in the Schedule of Quantities have been carefully determined from calculations based on data available at the time and should therefore be considered to be approximate quantities only. Before ordering materials of any kind the Contractor shall check with the Employer’s Agent whether or not the scope of the work for which the materials are required is likely to change substantially. No liability or responsibility whatsoever shall be attached to the Employer for materials ordered by the Contractor except when ordered in accordance with written confirmation issued by the Employer’s Agent.”

PSA 4 PLANT

PSA 4.1 SILENCING OF PLANT

REPLACE THE CONTENTS OF SUBCLAUSE 4.1 WITH THE FOLLOWING:

"The Contractor's attention is drawn to the applicable regulations pertaining to noise and hearing conservation, framed under the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as amended.

The Contractor shall at all times and at his own cost, be responsible for implementing all necessary steps to ensure full compliance with such regulations, including but not restricted to the provision and use of suitable and effective silencing devices for pneumatic tools and other plant which would otherwise cause a noise level in excess of that specified in the said regulations.

Where appropriate, the Contractor shall further, by means of temporary barriers, effectively isolate the source of such noise in order to comply with the said regulations."

PSA 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

ADD THE FOLLOWING PARAGRAPH BEFORE THE EXISTING FIRST PARAGRAPH IN SUBCLAUSE 4.2:

"The Contractor's buildings, sheds and other facilities erected or utilised on the Site for the purposes of the Contract shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. as may be required by the Contractor. The facilities shall always be kept in a neat and orderly condition.

No personnel may reside on the Site. Only night-watchmen may be on the Site after hours."

DELETE "and first-aid services" IN THE SECOND PARAGRAPH OF SUBCLAUSE 4.2 AND ADD THE FOLLOWING:

"The Contractor shall provide on the Site and in close proximity to the actual locations where the work is being executed, one toilet per 10 workmen, which toilets shall be effectively screened from public view and their use enforced. Such toilets shall be re-located from time to time as the location of the work being executed changes, so as to ensure that easy access to the toilets is maintained.

The Contractor shall, where applicable, make all necessary arrangements and pay for the removal of night soil."

PSA 5 CONSTRUCTION

PSA 5.1 SURVEY

PSA 5.1.2 Preservation and replacement of survey beacons and pegs subject to the Land Survey Act

DELETE THE WORDS "in the vicinity of boundaries" IN THE SECOND SENTENCE OF SUBCLAUSE 5.1.2 AND REPLACE THE WORDS "under the direction of" IN THE SAME SENTENCE WITH "in consultation and liaison with."

ADD THE FOLLOWING AFTER THE SECOND SENTENCE OF SUBCLAUSE 5.1.2:

"The Contractor and the Employer's Agent shall record on the said list, their concurrence or disagreement (as the case may be) regarding the completeness and accuracy of the details recorded therein."

REPLACE THE THIRD SENTENCE OF SUBCLAUSE 5.1.2 WITH THE FOLLOWING:

“At the completion of the Contract, the Contractor shall expose all pegs that were listed at the commencement of the construction as being in order and the Contractor shall arrange with a registered Land Surveyor for the checking of the positions of all such pegs and the replacement of those that the Land Surveyor’s check reveals have become disturbed or damaged. The Contractor shall, as a precedent to the issue of the Certificate of Completion, provide to the Employer’s Agent, a certificate from the registered Land Surveyor, certifying that all the pegs listed at the commencement of construction in accordance with the provisions of this clause, have been checked and that those found to have been disturbed, damaged or destroyed have been replaced in their correct positions, all in accordance with the provisions of the said Act.

The costs of all checking, replacement and certification as aforesaid shall be entirely for the Contractor’s account. This, with the provisions always that the Contractor shall not be held liable for the cost of replacement of pegs which:

- (c) cannot reasonably be re-established in their original positions by reason of the finished dimensions of the permanent works, and
- (d) the contractor can prove beyond reasonable doubt to the satisfaction of the Employer’s Agent, were disturbed, damaged or destroyed by others beyond his control.”

PSA 5.3 PROTECTION OF EXISTING STRUCTURES

REPLACE “Machinery and Occupational Safety Act, 1983 (Act No 6 of 1983)” WITH “Occupational Health and Safety Act, 1993 (Act No 85 of 1993), as amended,” AND INSERT THE FOLLOWING AFTER “(Act No. 27 of 1956)”: “as amended.”

PSA 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

REPLACE THE HEADING AND THE CONTENTS OF SUBCLAUSE 5.4 WITH THE FOLLOWING:

PSA 5.4 LOCATION AND PROTECTION OF EXISTING SERVICES

PSA 5.4.1 Location of Existing Services

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services which can reasonably be expected by an experienced and competent Contractor to be present on, under, over or within the Site.

Without in any way limiting his liability in terms of the Conditions of Contract in relation to damage to property and interference with services, the Contractor shall, in collaboration with the Employer’s Agent, obtain the most up-to-date plans as are available, showing the positions of services existing in the area where he intends to work. Neither the Employer nor the Employer’s Agent offers any warranty as to the accuracy or completeness of such plans and because services can often not be reliably located from plans, the Contractor shall ascertain the actual location of services depicted on such plans by means of careful inspection of the Site.

Thereafter, the Contractor shall, by the use of appropriate methodologies, carefully expose the services at such positions as are agreed to by the Employer’s Agent, for the purposes of verifying the exact location and position of the services. Where the

exposure of existing services involves excavation to expose underground services, the further requirements of sub Clauses 4.4 of GCC 2015 and 5.1.2.2 of SANS 1200 D (as amended) shall apply.

The aforesaid procedure shall also be followed in respect of services not shown on the plans but which may reasonably be anticipated by an experienced Contractor to be present or potentially present on the site.

All services, the positions of which have been determined as aforesaid at the critical points, shall henceforth be designated as 'known services' and their positions shall be indicated by the Contractor on a separate set of drawings, a copy of which shall be furnished to the Employer's Agent without delay.

As soon as any service which has not been identified and located as described above is encountered on, under, over or within the site, it shall henceforth be deemed to be a known service and the aforesaid provisions pertaining to locating, verifying and recording its position on the balance of the site shall apply. The Contractor shall notify the Employer's Agent immediately when any such service is encountered or discovered on the Site.

Whilst he is in possession of the Site, the Contractor shall be liable for all loss of or damage as may occur to

- (c) known services, anywhere along the entire lengths of their routes, as may reasonably be deduced from the actual locations at which their positions were verified as aforesaid, due cognizance being taken of such deviations in line and level which may reasonably be anticipated, and
- (d) any other service which ought reasonably to have been a known service in accordance with the provisions of this clause.

The Contractor shall also be liable for consequential damage in regard to (a) and (b), whether caused

directly by the Contractor's operations or by the lack of proper protection.

No separate payment will be made to the Contractor in respect of any costs incurred in preparing and submitting to the Employer's Agent the Drawings as aforesaid. These costs shall be deemed included in the Contractor's other tendered rates and prices included in the Contract.

Payment to the Contractor in respect of exposing services at the positions agreed by the Employer's Agent and as described above will be made under the payment items (if any) as may be provided for in the respective sections of the specifications pertaining to the type of work involved.

PSA 5.4.2 Protection During Construction

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

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

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

PSA 5.4.3 Alterations and Repairs to Existing Services

Unless the contrary is clearly specified in the Contract or ordered by the Employer's Agent, the Contractor shall not carry out alterations to existing services. When any such alterations become necessary, the Contractor shall promptly inform the Employer's Agent, who will either make arrangements for such work to be executed by the owner of the service, or instruct the Contractor to make such arrangements himself.

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

PSA-5.5 Dealing with water on the works

ADD THE FOLLOWING PARAGRAPH:

"It shall be noted that any claim for extension of time or for additional compensation dealing with water on the Works will not be considered, as this payment item shall be deemed to take in account of all additional resources or costs that may be required or incurred. The Contractor shall be deemed to have acquainted himself with the site conditions during tender stage. This will include the diversion of rivers to accommodate the laying of pipes through rivers."

PSA 5.7 Safety

REPLACE THE CONTENTS OF SUBCLAUSE 5.7 WITH THE FOLLOWING:

"Pursuant to the provisions of the Conditions of Contract, and without in any way limiting the Contractor's obligations thereunder, the Contractor shall at his own expense (except only where specific provision (if any) is made in the Contract for the reimbursement to the Contractor in respect of particular items), provide the following:

- (a) Provide to its Employees on the site of the works, all safety materials, clothing and equipment necessary to ensure full compliance with the provisions of the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as amended (hereinafter referred to as the Act) at all times, and shall institute appropriate and effective measures to ensure the proper usage of such safety materials, clothing and equipment at all times;
- (b) Provide, install and maintain all barricades, safety signage and other measures to ensure the safety of workmen and all persons in, on and around the site, as well as the general public;

- (c) Implement on the site of the works, such procedures and systems and keep all records as may be required to ensure compliance with the requirements of the Act at all times;
- (d) Implement all necessary measures so as to ensure compliance with the Act by all subcontractors engaged by the Contractor and their employees engaged on the works;
- (e) Full compliance with all other requirements pertaining to safety as may be specified in the Contract.

The Employer and the Employer's Agent shall be entitled, although not obliged, to make such inspections on the site as they shall deem appropriate, for the purpose of verifying the Contractor's compliance with the requirements of the Act. For this purpose, the Contractor shall grant full access to the site of all parts of the site and shall co-operate fully in such inspections and shall make available for inspection all such documents and records as the Employer's and/or Employer's Agent representative may reasonably require.

Where any such investigations reveal, or where it comes to the Employer's Agent attention that the Contractor is in any way in breach of the requirements of the Act or is failing to comply with the provisions of this clause, the Employer's Agent/Engineer shall, in accordance with the provisions of Clause 5.11 be entitled to suspend progress on the works or any part thereof until such time as the Contractor has demonstrated to the satisfaction of the Employer's Agent/Engineer, that such breach has been rectified.

The Contractor shall have no grounds for a claim against the Employer for extension of time and/or additional costs if the progress on the works or any part thereof is suspended by the Employer's Agent in terms of this clause, and the Contractor shall remain fully liable in respect of the payment of penalties for late completion in accordance with the provisions of Clause 5.13.1 should the Contractor fail to complete the Works on or before the specified due completion date in consequence of the suspension.

Persistent and repeated breach by the Contractor of the requirements of the Act and/or this clause shall constitute grounds for the Employer's Agent to act in terms of Clause 9.2.1.3.5 and for the Employer to cancel the Contract in accordance with the further provisions of the said Clause 9.2.

ADD THE FOLLOWING SUBCLAUSES TO CLAUSE 5:

PSA 5.9

Site Meetings

The Contractor or his authorised agent will be required to attend regular site meetings, which shall normally be held once a month on dates and at times determined by the Employer's Agent/Engineer, but in any case whenever reasonably required by the Employer's Agent/Engineer. Unless otherwise indicated in the Contract or instructed by the Employer's Agent/Engineer, such meetings shall be held at the Contractor's offices on the site. At such monthly meetings, matters such as general progress on the works, quality of work, problems, claims, payments, and safety shall be discussed, but not matters concerning the day-to-day running of the Contract.

PSA 6 TOLERANCES

ADD THE FOLLOWING SUBCLAUSE TO CLAUSE 6:

PSA 6.4 USE OF TOLERANCES

No guarantee is given that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified, or when clearly not applicable, all quantities for measurement and payment shall be determined from the 'authorised' dimensions. These are specified dimensions or those shown on the drawings or, if changed, as finally prescribed by the Employer's Agent, without any allowance for the specified tolerances. Except if otherwise specified all measurements for determining quantities for payment will be based on the 'authorised' dimensions.

If work is constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the calculation of quantities will be based on the 'authorised' dimensions, regardless of the actual dimensions to which the work has been constructed.

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Employer's Agent may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be calculated based on the actual dimensions as constructed."

PSA 7 TESTING

PSA 7.2 APPROVED LABORATORIES

REPLACE THE CONTENTS OF SUBCLAUSE 7.2 WITH THE FOLLOWING:

"Unless otherwise specified in the relevant specification or elsewhere in the Project Specification, the following shall be deemed to be approved laboratories in which design work, or testing required in terms of a specification for the purposes of acceptance by the Employer's Agent of the quality of materials used and/or workmanship achieved, may be carried out:

- (e) Any testing laboratory certified by the South African National Accreditation Systems (SANAS) in respect of the nature and type of testing to be undertaken for the purposes of the Contract;
- (f) Any testing laboratory owned, managed or operated by the Employer or the Employer's Agent;
- (g) Any testing laboratory established and operated on the Site by or on behalf of the Employer or the Employer's Agent;
- (h) Any other laboratory that the Employer's Agent approves in his absolute discretion."

PSA 8 MEASUREMENT AND PAYMENT PSA 8.1 MEASUREMENT

PSA 8.1.2 Preliminary and General Item or Section PSA 8.1.2.1 Contents

REPLACE THE LAST SENTENCE OF SUBCLAUSE 8.1.2.1(b) WITH THE FOLLOWING:

“Separate items will be scheduled to cover the fixed, value-related and time-related components of the Contractor’s preliminary and general costs.”

PSA 8.2 PAYMENT

PSA 8.3 Scheduled Fixed-Charge and Value-Related Items

REPLACE THE CONTENTS OF SUBCLAUSE 8.2.1 WITH THE FOLLOWING:

PSA 8.3.1 Contractual Requirements - Fixed-charge Items

Payment of fixed charges in respect of item 8.3.1 will be made as follows:

Payment of fixed charges in respect of item 8.3.1 will be paid at 80% once the contractor has complied with the following :

7. For providing sureties
8. For providing insurance of the works and plant;
9. For providing third party and public liability insurance
10. For providing compliance to Workmen’s Compensation Act and COIDA
11. For providing the approved safety file
12. Site establishment is complete and complies with the standards set out elsewhere in the document.

20% will be paid at completion or expiry of the IPW once the contractor has de-established and rehabilitated the site camp.

No adjustment will be made to the sum tendered in respect of item 8.3.1 should the value of the works finally executed or the time for completion vary in any way from that specified in the tender. The contractual requirements will be adjusted proportionally as per the size and value of the project. The latter will be negotiated per project award. If any of the above items are outstanding, the Contractor may not commence with works and the item will not be paid.

PSA 8.2.3 Payment for Time-related Items

The sum tendered for these items will be paid in subject to the provision of SANS sub clauses 8.2.3 and 8.2.4 payment will be paid under subclause 8.4.1 (time related item) thus, will be made monthly provided always that the total of the monthly amounts so paid for the item is not out of proportion to the value of progress of the works as a whole including materials on site. 8.2.4.1 Should the contractor fail to continue provide all or part the services or to meet all or part of the obligations, approved programme and liabilities required of him in a particular period in respect of any item, the payment of all or part of the relevant incremental time related item may be withheld until the required service has been provided or obligation, liability has been discharged and the programme have been caught up with.

PSA 8.3

SCHEDULED FIXED-CHARGE AND VALUE-RELATED CHARGE

ADD THE FOLLOWING NEW PAYMENT ITEMS TO CLAUSE 8.3.2

PSA 8.3.2.1

FACILITIES FOR EMPLOYER’S AGENT

The Contractor is to provide one furnished site office for the use of the Employer’s Agent and his representa-
tives to the requirements of SANS 1200 B 3.2 or similar approved. A monthly time-related provisional sum has
been included in the Schedule of Quantities to cover the rental costs of accommodation for the Employer’s
Agent. These amounts shall be payable by the Contractor to the Employer’s Agent according to the provisional
sums allowed and upon receipt of a tax invoice for such amounts.

The Contractor shall provide and maintain one carport with waterproof roofing for the duration of the Contract
for the use of the Employer’s Agent. The floor shall consist of crushed aggregate to alleviate dust and muddy
conditions or similar approved.

a) Furnished Office

Unit: Sum

The Contractor shall provide, furnish and equip one or more offices (as scheduled) for the use of the Em-
ployer’s Agent.

Each office shall be weatherproof, shall have a wooden boarded floor that is at least 150 mm above the
ground, and shall be provided with a ceiling and a lining to the walls, or equivalent insulation, with an accepta-
ble type of door with a secure lock, and two opening windows of glazed. Each office shall be well ventilated
and shall be so insulated as to provide comfortable working conditions.

Office building shall be painted with an approved paint after erection and the paintwork shall be maintained
during the contract period.

Each door shall be provided with a lock and two keys.

The sitting of all offices shall be to the Employer’s Agent’s satisfaction and shall be decided upon in
consultation with him/her and confirmed in writing before erection. The offices shall comply with the following
requirements.

<u>Dimensions</u>	<u>Type 1 Office</u>
Minimum floor area	30 m2
Minimum window area	4.0 m2
Minimum window area opening	2.4 m2
Minimum clear height	2.5 m
Shaded parking for vehicles	2

Furniture and Equipment

Each office shall be equipped with the following:

- (xvii) Office desk with a surface area of at least 1.5m2 with at least 3 drawers one of which can be locked.
- (xviii) Two office chairs.
- (xix) One high back office chair.

-
- (xx) a lockable upright steel cabinet with three shelves or a steel filing cabinet with four drawers
 - (xxi) Refrigerator (maximum 150 litres).
 - (xxii) Microwave oven (maximum 30 litres).
 - (xxiii) Sufficient racks and hangers for hanging contract drawings. The hangers shall be of the "Barhold" type, with one hanger to five drawings.
 - (xxiv) Double 80-watt fluorescent light fittings complete with ballast and tubes (2 per Type 1 office).
- In addition to the above the Type 1 office shall be equipped with the following:
- (xiii) Conference table large enough to accommodate twelve people and have an area of at least 15m².
 - (xiv) Fifteen office chairs.
 - (xv) The Contractor shall also supply a toilet for the exclusive use of the Employer's Agent.
 - (xvi) The Contractor must provide basic survey instruments: dumpy level, tripod stand and staff.
 - (xvii) Time lapse camera x 2
 - (xviii) Weather station x 1

On completion of the Works, ownership of the buildings, furnishings and equipment shall revert to the Contractor who shall remove them from the Site.

a) Communication

Unit: Sum

A Cellular phone should be provided for the Employer's Agent Representative for the duration of the contract. The phone should operate with an iOS or Android status and be able to take pictures and connect to the internet.

c) Name Board

Unit: Sum

Two (2) nameboards will be ordered by the Contractor according to the Employer's Agent's specifications, complete with dimensions, wording and specifications as prescribed in *standard drawing details provided*, within one month from the commencement date. The Contractor shall be responsible to transport the name board to site and to erect it at the indicated position on suitable supporting posts. The Contractor shall remove the name board completely from site after construction is completed, before the last payment certificate shall be approved.

d) Computer facilities

Unit: Sum

The Contractor shall provide the following computer facilities together with the specified software installed, for the exclusive use of the Employer's Agent and his staff, in accordance with the requirements of SABS 1200 AB (as amended):

- 1 computer (As specified below)
- 1 printer (As specified below)
- 1 Cellphone (iPhone 11 or equivalent)

The computer shall comply with the following minimum specifications:

Operating System: Windows 10, HDMI Input: HDMI-out, USB Ports: 3, Connectivity: Wi-Fi / Ethernet / Bluetooth, Includes: Carry case and Mouse, Processor: Intel i7, Memory: , 32GB RAM minimum, Storage: 1TB HDD(solid state drive), Graphics: Intel HD Graphics 5500, Optical Drive: Built-in DVD drive, Display Size: 15" + Printers shall, unless otherwise approved by the Employer's Agent/Engineer, be capable of print, copy scan features (1200x1200dpi resolution, 1200dpi scan resolution, 150 sheet paper input, high speed USB 2.0)

All computer hardware shall be provided complete with the requisite connecting cables and all interfacing devices and software necessary for its efficient operation as an integral system.

The following software shall be properly installed on the computer, and the original licence

agreements and disks shall be provided to the Employer's Agent for safekeeping:

All computer equipment provided shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Employer's Agent's staff.

The Contractor shall further provide at his own cost, all paper and black ink cartridges and other consumables reasonably required by the Employer's Agent.

e) Survey Equipment

Unit: Sum

The Contractor shall provide the following survey equipment on the site from the commencement to the completion of the works, which shall also be available for the use of the Employer's Agent and his representatives.

iv) 1 X 100m Steel measuring tape;

v) Steel pegs, shovels, picks etc. which the Employer's Agents Representative may require during the contract;

vi) Equipment to verify setting out of works as per Employer's Agent's request.

PSA 8.3.2.2 FACILITIES FOR CONTRACTOR (FIXED-CHARGED RELATED ITEMS)

g) Water supply

Unit: Sum

This item will include water for Construction (General use and water tightness testing) and consumption of all workers on site, full application fee amount for connection in which the Contractor will apply for.

AND

Electric Power

Unit: Sum

This item will include supply of electricity either by generator or fixed electrical connection for Construction and consumption of all workers on site, full application fee amount for connection in which the Contractor will apply for.

AND

j) Plant (General)

Unit: Sum

This item will include costs of providing, establishing, and commissioning on site the following minimum plant requirements:

ADD THE FOLLOWING NEW PAYMENT ITEMS TO "CLAUSE 8.3.3: ADDITIONAL FIXED CHARGE OBLIGATIONS":

PSA 8.3.3 Additional Contractual Obligations

PSA 8.3.3.1 Issuing of Notices to consumers

Unit: Sum

The sum shall cover the full compensation and cost of supply and delivery of the notices and warnings to customers at least 3 days before a shutdown is to take place in each section of work.

PSA 8.3.3.2 OHS Act Obligations

Unit: Sum

The sum shall cover the full compensation and fixed costs for the compliance with the Occupational Health and Safety Act (85 of 1993), Construction Regulations 2017 and all the requirements stipulated in the Employer's Health and Safety Specifications."

PSA 8.3.3.3 EMP Obligations

Unit: Sum

The sum shall cover the full compensation and all fixed costs for compliance with the requirements of The Employer's Environmental Management Plan.

PSA 8.4 SCHEDULED TIME-RELATED ITEMS

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 8.4. The unit of measurement for all sub-items under PSA 8.4 shall be amended from "sum" to "months". The full amount for this item will be compensated for the duration of construction should the contractor complete the works earlier.

PSA 8.4.2 OPERATION AND MAINTENANCE OF FACILITIES ON SITE FOR THE DURATION OF CONSTRUCTION, EXCEPT WHERE OTHERWISE STATED

The tendered amounts for the fixed-charge items in the General Section of the Schedule of Quantities would not be subject to any variation if the actual value of the work done exceeds or falls short of the accepted tendered amount within the limit stated in Clause 6.11 of the General Conditions of Contract (2015).

PSA 8.4.2.1 FACILITIES FOR EMPLOYER'S AGENT (TIME RELATED ITEMS)

a) Furnished Office

Unit: Sum

The Contractor will be responsible for maintaining the condition of the Employer's Agent Office monthly as specified in PSA 8.3.2.1.a.

b) Cellular Telephone

Unit: Sum

The Contractor is responsible for maintaining the condition of the cellular telephone as specified in PSA 8.3.2.1.b.

c) Name boards

Unit: Sum

The Contractor will be responsible for maintaining the condition of the name boards monthly as specified in PSA 8.3.2.1.c.

d) Computer Facilities

Unit: Sum

The Contractor will be responsible for maintaining the condition of the computer equipment monthly as specified in PSA 8.3.2.1.d.

e) Survey Equipment

Unit: Sum

The Contractor will be responsible for maintaining the condition of the survey equipment monthly as specified in PSA 8.3.2.1.e.

PSA 8.4.2.2 FACILITIES FOR CONTRACTOR (TIME RELATED ITEMS)

g) Water supply, electric power

Unit: Sum

The Contractor will be paid out of each monthly payment certificate as per Tendered Rates.

j) Plant (General)

Unit: Sum

This item will include all operating and maintenance costs for the period of the Contract for the following minimum plant requirements: Payment will be according to the below distribution

Excavator	30%
Tipper Truck	30%
TLB	20%
Water Pump	10%
Plate Compactor	10%

ADD THE FOLLOWING NEW PAYMENT ITEMS AS ADDITIONAL "TIME-RELATED OBLIGATIONS":

PSA 8.4.6 Additional Obligations**PSA 8.4.6.1 OHS Act Obligation****Unit: Month**

The sum shall cover the full compensation and all time related costs for the duration of the contract, for the compliance with the Occupational Health and Safety Act (85 of 1993), Construction Regulations 2017 and all the requirements stipulated in the Employer's Health and Safety Specifications. The cost shall include the salary for a full time OHS Officer for the project. As a minimum requirement the OHS Officer needs to be professionally registered at SACPCMP.

PSA 8.4.6.2 Security services costs**Unit: Month**

The sum shall cover the full compensation and all costs for a sufficient 24 hour guarded services for the duration of the contract.

PSA 8.4.6.4 EMP Compliance**Unit: Month**

The sum shall cover the full compensation and all time related costs for the duration of the contract, for the compliance with the Environmental Management Plan, and all the requirements stipulated in the plan.

PSA 8.5 SUMS STATED PROVISIONALLY BY EMPLOYER'S AGENT

AMEND SUBCLAUSE 8.5.b)1 AND ADD THE FOLLOWING ITEMS:

PSA 8.5.1 a) Electricity installation (nominated sub-contractor)...**Unit: Stated Sum**

The sum shall include for the Installation and connection fee for power supply to the site, supply and installation (by approved nominated sub-contractor) for the cabling, distribution boards, conductors, sleeves, light switches, socketed outlets, luminaries and equipment, conduit boxes and fittings, testing/commissioning and supply and installation requirements for the new infrastructure.

PSA8.5.2 a) Safeguarding of excavations as required by the Employer's Agent/Engineer.....**Unit: Stated Sum**

The sum shall include for the strutting, shoring and safeguarding excavations.

PSA 8.5.3 a) Control tests by independent... **Unit: Stated Sum**

The sum shall include for any additional tests required by the Employer's Agent on soil, concrete, any other material or workmanship by independent laboratories or specialist service providers.

PSA 8.5.4 a) Relocation of existing services by Services utility **Unit: Stated Sum**

The sum shall include for the relocation of existing water mains, gas pipelines, overhead/underground electricity cables, fibre, poles, etc. by the relevant services utility (such as Eskom, Telkom, RW, Communications Companies, etc.) that may not be permitted by the Contractor.

PSA 8.5.5 a) Additional surveys and underground service detection by nominated specialist..... **Unit: Stated Sum**

The allowance shall include for the hiring of specialist equipment or nominated specialist sub-contractors for surveying and/or detection of underground services as required by the Employers Agent.

PSA 8.5.6 a) Provision for training of targeted labourers... **Unit: Stated Sum**

The contractor shall provide and facilitate all the necessary on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract in a manner that does not compromise worker health and safety. All training courses shall be accredited and be approved by the CoE Project Manager and Employers Agent.

PSA 8.5.8 a) Community Liaison Officer. **Unit: Stated Sum**

The sum shall cover the cost of the duly elected representative's salary, travel and communication costs for the full duration of the project, as prescribed by the Municipality.

PSA 8.5.9 a) Supply or hire of specialist equipment. **Unit: Stated Sum**

The sum shall cover the cost for the supply, operation and/or hire of specialist equipment for detection of underground services as ordered by the Employer's Agent.

PSA 8.7 DAYWORKS

ADD THE FOLLOWING NEW CLAUSES:

PSA 8.7.1 Scope

This section covers the method of measurement and payment for work carried out on a day work basis.

PSA 8.7.1.1 General Requirements

Work will be classified as day work only if the Employer's Agent considers no other rate in the Bill of Quantities appropriate for payment purposes.

An instruction regarding all work to be carried out under day work in terms of Clause 6.5 of the General Conditions of Contract 2010 will be issued at the discretion of the Employer's Agent. Some or all of the items priced under day work in the Bill of Quantities may possibly not be required for this Contract.

Before ordering any material, the Contractor shall submit quotations to the Employer's Agent for his approval and shall submit such receipts or vouchers to the Employer's Agent as may be necessary for proving the amount claimed.

Rates tendered for dayworks may also be utilised, at the discretion of the Employers Agent, for any deficits that may present itself in the procurement negotiations between the Contractor and local enterprises, in fulfilment of the local contract participation goals outlined in the Contract.

PSA 8.7.1.2 Measurement and Payment - Day works

The day work rates submitted for vehicles and construction equipment, in the Bill of Quantities shall be a hire charge for the use of the vehicle and driver or constructional plant/equipment and operator (excluding VAT) and shall apply only to vehicles and construction equipment approved in writing by the Employer's Agent. The rate shall include for maintenance, fuels and oils and other operating costs, establishment, insurance and other contingency costs relating to the running of the vehicle, plant or equipment. (This is all defined as the wet rate).

Where there is ambiguity between the power developed at the flywheel and mass of a machine, the power shall govern the measurement category.

The Contractor and the Employer's Agent will agree on the method of recording the working hours prior to the commencement of the work. Any long period of idling at any one time which in the opinion of the Employer's Agent or his representative is beyond that required for normal operating conditions will not be paid for as working time. Non-working hours for any reason shall not be measured for payment.

The ten percent allowed for overheads etc. as per Clause 6.5.1.2.3 of the General Conditions of Contract 2015 shall include full compensation for all administrative costs, supervision, overheads, liabilities and obligations related to the running of the vehicles, constructional plant and equipment. The tendered percentage shall also include for profit and shall be subject to the Contract Price Adjustment factor laid down in the Contract Data.

Skilled workers will be defined as all construction supervisors. Semi-skilled will be all the contractor's employees reporting to the skilled workers. Unskilled will be all targeted labourers.

PSAB EMPLOYER'S AGENT/ENGINEERS OFFICE (SANS 1200AB-1986) PSA 3 MATERIALS

PSAB 3.1 Nameboards

Delete and replace with the following:

Two (2) nameboards will be ordered by the Contractor according to the Employer's Agent's specifications, complete with dimensions, wording and specifications as prescribed in standard drawing details provided, within one month from the commencement date. The Contractor shall be responsible to transport the name board to site and to erect it at the indicated position on suitable supporting posts. The Contractor shall remove the name board completely from site after construction is completed, before the last payment certificate shall be approved.

PSAB 3.2 Office Building(s)

Delete the first sentence and substitute the following:

The Contractor shall provide, furnish and equip one or more offices (as scheduled) for the use of the Employer's Agent.

Each office shall be weatherproof, shall have a wooden boarded floor that is at least 150 mm above the ground, and shall be provided with a ceiling and a lining to the walls, or equivalent insulation, with an acceptable type of door with a secure lock, and two opening windows of glazed. Each office shall be well ventilated and shall be so insulated as to provide comfortable working conditions.

Office building shall be painted with an approved paint after erection and the paintwork shall be maintained during the contract period.

Each door shall be provided with a lock and two keys.

The sitting of all offices shall be to the Employer's Agent's satisfaction and shall be decided upon in consultation with him/her and confirmed in writing before erection.

The offices shall comply with the following requirements.

<u>Dimensions</u>	<u>Type 1 Office</u>
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Minimum floor area	30 m2
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Minimum window area	4.0 m2
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Minimum window area opening	2.4 m2
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Minimum clear height	2.5 m
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Shaded parking for vehicles	2
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Furniture and Equipment

Each office shall be equipped with the following:

- (ix) Office desk with a surface area of at least 1.5m2 with at least 3 drawers one of which can be locked.
- (x) Two office chairs.
- (xi) One high back office chair.
- (xii) a lockable upright steel cabinet with three shelves or a steel filing cabinet with four drawers

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- (xiii) Refrigerator (maximum 150 litres).
 - (xiv) Microwave oven (maximum 30 litres).
 - (xv) Sufficient racks and hangers for hanging contract drawings. The hangers shall be of the “Barhold” type, with one hanger to five drawings.
 - (xvi) Double 80-watt fluorescent light fittings complete with ballast and tubes (2 per Type 1 office).
- In addition to the above the Type 1 office shall be equipped with the following:
- (vii) Conference table large enough to accommodate twelve people and have an area of at least 15m².
 - (viii) Fifteen office chairs.
 - (ix) The Contractor shall also supply a toilet for the exclusive use of the Employer’s Agent.
 - (x) The Contractor must provide basic survey instruments: dumpy level, tripod stand and staff.
 - (xi) Time lapse camera x 2
 - (xii) Weather station x 1

On completion of the Works, ownership of the buildings, furnishings and equipment shall revert to the Contractor who shall remove them from the Site.

PSAB 4 PLANT

PSAB 4.1 Telephone

Delete sub-clause and substitute the following:

A cellular phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded apps, shall be provided by the Contractor for the sole use of the Employer’s Agent/Engineer’s Representative. The Contractor will be required to pay the connection charges, service fees, rent, insurance’s, operation and maintenance costs, including all consumption and call charges with regard to the above, with the provision that the total cellular phone call charges do not exceed R2500.00 per month.

PSAB 4.2 Survey Equipment (New Clause)

Add new Sub-Clause:

The Contractor shall provide the following survey equipment on the Site for use by the Employer’s Agent from the commencement to the completion of the Works:

- One automatic reading Employer’s Agent/Engineer’s level plus tripod;
- One levelling staff (5 m long, 1 cm graduations);
- One staff angle bubble;
- One metal change-point for levelling;
- One separate plumb-bob;
- One spirit level (one metre long);
- One hammer (2 kg) with steel or wooden pegs as necessary;
- One 50 m steel tape;
- One 5,0 m (or longer) retractable steel tape.

The Contractor shall keep the equipment continuously insured against any loss, damage, or breakage and he/she shall indemnify the Employer's Agent and the Employer against any claims in this regard. Upon completion of the Works the survey equipment as listed above shall revert to the Contractor.

The Contractor shall maintain the equipment in good working order and keep it clean until the completion of the Works. The Employer's Agent/Engineer's level is to be calibrated at an accredited facility on a quarterly basis.

PSAB 4.3 Computer (New Clause)

Add new Sub-Clause:

The Contractor shall provide the following computer facilities together with the specified software installed, for the exclusive use of the Employer's Agent and his staff, in accordance with the requirements of SABS 1200 AB (as amended):

- 1 computer (As specified below)
- 1 printer (As specified below)

The computer shall comply with the following minimum specifications:

Operating System: Windows 10, HDMI Input: HDMI-out, USB Ports: 3, Connectivity: Wi-Fi / Ethernet / Bluetooth, Includes: Carry case and Mouse, Processor: Intel i7, Memory: , 32GB RAM minimum, Storage: 1TB HDD(solid state drive), Graphics: Intel HD Graphics 5500, Optical Drive: Built-in DVD drive, Display Size: 15" +

Printers shall **BE** approved by the Employer's Agent/Engineer, before procuring.

All computer hardware shall be provided complete with the requisite connecting cables and all interfacing devices and software necessary for its efficient operation as an integral system.

The following software shall be properly installed on the computer, and the original licence agreements and disks shall be provided to the Employer's Agent for safekeeping:

All computer equipment provided shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Employer's Agent's staff.

The Contractor shall further provide at his own cost, all paper and black ink cartridges and other consumables reasonably required by the Employer's Agent.

PSAB 5 CONSTRUCTION

PSAB 5.2 Employer's Agent Office

Add to the Sub-Clause:

The toilet facilities provided for the sole use of the Employer's Agent, or his/her representative(s) shall be of the chemical type, maintained in a hygienic and sanitary condition and shall be removed on completion of the Works. The facilities provided shall conform to the local health authority's requirements as applicable and the Contractor shall pay all sanitary fees and charges.

PSAB 5.4 Telephone

Delete sub-clause and substitute the following:

A cellular phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded apps, shall be provided by the Contractor for the sole use of the Employer's Agent/Engineer's Representative. The Contractor will be required to

pay the connection charges, service fees, rent, insurance's, operation and maintenance costs, including all consumption and call charges with regard to the above, with the provision that the total cellular phone call charges do not exceed R2000.00 per month.

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 odours.

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.

PSC 5.2 **CUTTING OF TREES**

PSC 5.2.3 **Preservation of trees PSC 5.2.3.2 Individual trees**

REPLACE THE LAST SENTENCE WITH THE FOLLOWING:

“An amount of R 1000.00 will be deducted from moneys due to the Contractor as a penalty for every tree that is damaged or removed unnecessarily.”

PSC 5.9 **Clear and grub site for trench construction**

The working space for construction is to be cleared. This is to include working space for a pipe laying platform, an access road, pipe storage strip and pipe storage mounds alongside the trench for pipe laying operations. Once the contract is complete all temporary work will be cleared and the area returned to its original condition.

PSC 5.10 **Remove and grub large trees and tree stumps of girth over 1m**

As far as practical, trees are to remain in position. The Contractor may remove trees that prevent access or construction with the prior approval of the Engineer.

PSC 8 **MEASUREMENT AND PAYMENT**

PSC 8.2 **PAYMENT**

PSC 8.2.1 **Clear and grub**

REPLACE THE FIRST LINE WITH THE FOLLOWING:

“The area designated by the Employer’s Agent to be cleared and grubbed will be measured in square meter the nearest square meter”

PSC 8.2.5 Take down existing fences

REPLACE ITEM 8.2.5 WITH THE FOLLOWING:

PSC 8.2.5 Take down existing fences:

- | | | |
|-----|----------------------|----------------|
| (a) | Description of fence | Unit: m |
| (b) | Etc. for other items | |

The unit of measurement shall be the metre or kilometer of fence taken down and removed from the site.

The rate shall cover the cost of taking down the complete fence (fence height up to 2m) as scheduled and removing all fence material from the site, filling of holes, leveling ground surfaces and cleaning the site as well as providing temporary fence during construction."

PSC 8.2.8 Demolish and remove structures/buildings and dismantle steelwork, etc.

REPLACE "Unit: sum" WITH "Unit: sum or number of m²".

REPLACE THE LAST SENTENCE WITH:

"The rate shall cover the cost of all such separate items as scheduled in the Schedule of Quantities."

ADD THE FOLLOWING ITEMS:

PSC 8.2.11a Temporary fencing or hoarding:

- | | | |
|-----|--|----------------|
| (a) | Indicate temporary usage, description and type | Unit: m |
| (b) | Etc. for other usage and types. | |

The unit of measurement shall be the linear metre of fence or hoarding supplied and erected, and in the case of temporary fencing for maintaining and removing on completion of the works or part of the works.

The tendered rate shall include full compensation for the cost of supplying and erecting the complete fence as specified or scheduled and in the case of temporary fencing for taking down the fences, removing from the site, filling of holes, leveling ground surfaces and cleaning the site.

Seventy per cent (70%) of the tendered rate shall be payable on completion and approval of the temporary fences, and the remaining thirty per cent (30%) on completion of the removal of the fences.

The tendered rate shall include full compensation all labour, plant, material and equipment required for taking down and dismantling all components relevant to the type of existing wall or fences specified, including the removal of all support posts, bolts, nuts and washers, coiling wires, loading, transporting, unloading of the material to a designated site approved by the Engineer, neatly and carefully stacking the materials, and all labour, plant, equipment required for re-erecting the stored and/or replaced wall or fence material, complete with support posts, necessary excavations, foundations and backfilling. Any damage to fencing materials removed and dismantled by the Contractor shall be the responsibility of the Contractor to replace, and at his own expense.

Sufficient digital photographs of all walls and fences affected along the pipeline route shall be taken by the Contractor, compiled electronically, indexed and handed over to the Engineer before construction/removal commences. The cost thereof shall be deemed to be included in the rates tendered.

PSC 8.2.11b Removal of man-made surfaces

The rate shall cover all plant, labour, material, saw cutting (asphalt and concrete), breaking up, lifting, loading, transportation, off-loading surfacing and storing (where applicable). Unit: m²

Roadways, Asphalt and other layers

- i) Asphalt ($\leq 50\text{mm}$ thick) and including base, sub-base and subgrades layers up to 800mm deep.
- ii) Asphalt ($> 50 \leq 100\text{mm}$ thick) and including base, sub-base and subgrades layers up to 800mm deep.

a) Footways and driveways

Asphalt $\leq 50\text{mm}$ thickness

Asphalt $> 50 \leq 100\text{mm}$ thickness

Interlocking concrete segmental paving blocks (all colours)

Concrete slabs (450 x 450mm)

Brick paving

Unreinforced concrete $\leq 75\text{mm}$ thick

Reinforced concrete $\leq 75\text{mm}$ thick

Grassing

Kerbing (all types of kerbing)

Unit: m²

PSC 8.2.12 Backfilling and reinstatement of man-made surfaces

The rate shall cover the cost of all associated plant, labour, material, loading, transportation from storage, off-loading and placing (levelling and compacting where applicable) the following materials in roadways, footways and driveways in accordance with the COP:

PSC 8.2.12.1 Backfilling and reinstatement of roads

Unit: m²

a) Scenario A

- i) 150mm base – G2 Graded crushed stone to 102% Mod AASHTO density
- ii) 150mm subbase – G5 Graded crushed stone to 97% Mod AASHTO density
- iii) 150mm Fill – G7 material compacted to 95% Mod AASHTO density
- iv) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO

b) Scenario B

- i) 150mm base – G2 material compacted to 97% Mod AASHTO density
- ii) 150mm subbase – C4 Stabilised gravel material to 95% Mod AASHTO density*
- iii) 150mm selected subgrade - Insitu material compacted to 93% Mod AASHTO

***Rate shall include stabilization agent.**

c) Scenario C (Foot paths)

- i) 150mm base – Recovered material compacted to 93% Mod AASHTO
- ii) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO

d) Surfacing

- i) 30mm Bitumen hot –mix: Fine
- ii) 70mm Bitumen hot –mix: BTB

PSC 8.2.12.2 Backfilling and reinstatement footways

- a) Using removed materials:
 - iii) Interlocking concrete segmental paving blocks (all colours)
 - iv) Concrete slabs (450 x 450mm)
 - v) Brick paving
 - vi) Grassing
 - vii) Kerbing... Unit:m
- b) Using new supplied materials:
 - i) 30mm Bitumen hot –mix: Fine
 - ii) Interlocking concrete segmental paving blocks, including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and blocks
 - 1) Grey blocks
 - 2) Coloured blocks
 - iii) Concrete slabs (450 x 450mm) including a 20mm river sand bedding layer, jointing mortar.
 - iv) Brick paving including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and bricks.
 - v) Unreinforced concrete $\leq 75\text{mm}$ thick (15MPa)
 - vi) Reinforced (395 mesh) concrete $\leq 75\text{mm}$ thick (15MPa)
 - vii) Grassing
 - viii) Concrete channeling, including formwork, leveling and compacting 300 x 125mm cast in situ concrete of 15MPa.
 - ix) Kerbing, including a 50mm bedding (cement and river sand), jointing mortar and 15MPa concrete haunching at all joints. (Unit:m)
 - 1) Figure 1
 - 2) Figure 7
 - 3) Figure 8
 - 4) Figure 12

PSC 8.2.13 Reinstatement of existing masonry walls and steel palisade fences

The rate shall cover the cost of reinstating existing masonry walls, plastered or unplastered, and steel palisade fences (including any gates) including plant, labour, material, on-loading, transporting, off-loading and cleaning for the following:

Unit: m2

- a) Face brick
 - i. 110mm wall
 - ii. 220mm wall
 - iii. 330mm wall
- b) Plastered
 - i. 110mm wall
 - ii. 220mm wall
 - iii. 330mm wall
- c) Steel palisade fences (height = 2.1m)

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 be 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 pock 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

- a) to 90% Proctor density:
- b) Such that in excess of 5 blows of a dynamic come penetrometer (DCP) is required to penetrate 100 mm of the backfill, provided that backfill does not comprise more than 10% gravel of size less than 10mm and contains no isolated boulders, or
- c) Such that the density of the compacted trench backfill is not less than that of the surrounding undisturbed soil when tested comparatively with a DCP.

Excavation

All hand 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. All haul shall be considered as freehaul.

PSDA8.3 SCHEDULED ITEMS

All rates tendered shall include for the barricading, shoring, lights, road signs and safety measures required by the relevant authorities.

PSDB 8.1 BASIC PRINCIPLES

ADD THE FOLLOWING PRARGRAPH:

“The basic principle of measurement and payment for earthworks for a pipe trench is that the rates tendered for excavation shall also cover the cost of trimming, handling and shoring or bracing as specified in clause PSDB 5.4”.

PSDB 8.3 SCHEDULED ITEMS

PSDB 8.3.1 Site Clearance and (if specified) Removal of topsoil

RENAME THE FOLLOWING SUB-ITEM:

c) Removal, stockpiling and replacing of Topsoil (depth stated) Unit: m3

ALSO REPLACE THE LAST SENTENCE OF THIS SUB-ITEM:

“The rate for item (c) shall cover the cost of stripping to the stated depth, stockpiling, maintaining and replacing the topsoil, as well as the prevention of dust nuisance.”

PSDB 8.3.2 Excavation

a) Excavate in all materials, for trenches, backfill compact and dispose of surplus material

ADD THE FOLLOWING SUB-ITEM:

The rate shall also cover the cost of excavating for trenches using labour intensive construction methods. The rate shall exclude the cost of removal of grass sods and compaction but shall include for the disposal of surplus/unsuitable material. The rate shall, in addition, cover the costs for compliance with the requirements of PSDB 5.4.1.

b) Extra over item (a) above for:

ADD THE FOLLOWING AT THE END OF THE EXISTING SUB-ITEM 2:

“No payments will be made under sub items (1) and (2) in respect of any materials measured and paid for under sub item 3 below.”

AND ADD THE FOLLOWING NEW SUBITEMS IN 8.3.2(b):

“(3) Hand excavation and backfill where ordered by the Engineer Unit: m³

The unit of measurement shall be the cubic metre of material, measured in place according to the authorised dimensions, which was excavated by the hand on the specific prior written instructions of the Engineer; provided always that the Engineer’s said instruction shall have stated that measurement and payment for such hand excavation will be in accordance with this item.

The tendered rate shall include full compensation for the additional cost, effort and time resulting from excavating in the respective materials using hand methods only.

The Engineer shall not be obliged to authorise payment under this item in respect of any hand excavation carried out (whether ordered in writing or otherwise), which hand excavation was in any case necessary to achieve compliance by the Contractor with his obligations under the Contract to

- (i) utilize construction appropriate to the nature of the specific parts of the works; and/or
- (ii) protect existing structures and/or services; and/or
- (iii) comply with all prevailing legislation and regulations.

(4) Cutting of premix and concrete surfaces Unit: m²

The cutting of premix and concrete surfaces shall be measured per square metre of cut as scheduled. Cutting of premix and concrete surfaces shall be done with a diamond tipped saw or by some other approved method. The depth of the cut shall be such that the adjoining premix and concrete surfaces are not disturbed when excavation takes place. The cutting of surfaces shall be done 100mm on either side of the trench.

(5) Backfill stabilised with 5% cement where directed by the Engineer...Unit: m³

The unit of measurement shall be the cubic metre of backfill material, measured in place after compaction according to the authorised dimensions, which was stabilised on the Engineer’s instructions in accordance with subclause PSDB 3.5(c).

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing, backfilling and compacting the stabilised material to 90% of modified AASHTO density.

(6) Soil-crete backfill where directed by the Engineer Unit: m³

The unit of measurement shall be the cubic metre of soil-crete placed on the Engineer’s instructions in accordance with subclause PSDB 3.5(d), measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete as well as for the cost of shuttering if required.”

AND ADD THE FOLLOWING NEW SUBITEMS IN 8.3.2:

“(d) Widening and deepening in all materials, for valve chambers and dispose of surplus material...
Unit: m³

The unit of measurement shall be the cubic metre of material, measured in place according to the authorised dimensions, but excluding the displaced volume of the pipe, already taken into account in item (a) above.

(a) Extra-over item (d) above for

(1) Intermediate Rock

Unit: m³

(2) Hard Rock

Unit: m³

PSDB 8.3.3 Excavation ancillaries

PSDB 8.3.3.1 Make up deficiency in backfill material (Provisional)

ADD THE FOLLOWING AFTER THE LAST SENTENCE:

“The rates for items (a), (b) and (c) shall also cover the sieving of material if instructed by the Engineer.”

ADD THE FOLLOWING SUBITEMS:

“(d) Supplying of 38 mm stone from any source as required **Unit: m3**

(e) Supplying soil for soil cement from any source... **Unit: m3**

(f) Crusher run from any source... **Unit: m3**

PSDB 8.3.3.3 Compaction in road reserves

REPLACE THE HEADING OF THIS SUBITEM WITH THE FOLLOWING:

“PSDB 8.3.3.3.3 Compaction in road crossings”

REPLACE THE SENTENCE, “The volume will be measured as specified in 8.2.2, 8.2.3 and 8.3.3.1”, WITH THE FOLLOWING:

“To determine the volume in the case of gravel roads, the depth will be measured from the underside of the gravel wearing course to the top of the fill blanket, and in the case of bitumen roads, from the underside of the subbase to the top of the fill blanket. The rest of the trench shall be backfilled as specified in clauses 5.9.3, 5.9.4 and 5.9.5, as applicable, and payment will be made under item 8.3.6.1.”

PSDB 8.3.3.4 Overhaul

REPLACE THE CONTENTS OF THIS ITEM WITH THE FOLLOWING:

“Measurement and payment shall be in accordance with subclause PSD 5.2.5.”

PSDB 8.3.4 Particular items

PSDB 8.3.4(a) Shore trench opposite structure or service

REPLACE THE HEADING OF THIS SUBITEM WITH THE FOLLOWING:

PSDB 8.3.4(a) Shore trench opposite structure or service for depths:”

ADD THE FOLLOWING AFTER THE LAST SENTENCE:

“Separate items will be measured for depths of trenches in increments of 1 m. The rate for each stated category shall cover the cost of shoring from ground level up to the full depth of the stated category. Payment for this item will only be made if written instructions were issued by the Engineer over and above the Standard Specifications for safety of excavations as specified in SANS 1200 DB, subclause 5.1.”

PSDB 8.3.4(b) Temporary works: Control water inflow from to

REPLACE THIS SUBITEM WITH THE FOLLOWING:

PSDB 8.3.4(b) Accommodation of existing flows for temporary or permanent connections or construction of new structures or pipe trenches:

1) (Description of item stated)

Unit: Sum

2) Etc. for other structures

The tendered sums shall include full compensation for any inconvenience suffered, for normal and exceptional risks, for unforeseen eventualities and for maintaining the accommodated flow as long as necessary and shall include for the design and construction of all necessary temporary measures such as additional clearing, grubbing, earthworks, culverts, structures, pipework, pumping, cleaning up and any other associated work that may be required as specified in Clause PS1.5. Where a temporary structure for the accommodation of an existing flow has been designed by the engineer and is to be constructed by the Contractor, payment for such structure shall, unless otherwise stated in the scheduled item, be made under the applicable sub items in this payment item."

PSDB 8.3.5 Existing services that Intersect or Adjoin a Pipe Trench

PSDB 8.3.5 a) Services that intersect a trench

ADD TO THE FIRST SENTENCE OF THIS SUB CLAUSE AS FOLLOWS:

After "Except where water pipes are to be recovered" add "*and water leads for erf connections need to be renewed*"

ADD THD NEW SUBCLAUSE PSDB 8.3.5 c) TO CLAUSE 8.3.5 AS FOLLOWS:

PSDB 8.3.5(b) SERVICES THAT ADJOIN A TRENCH Unit: m

Add the following clause:

No payment will be made for overhead services except where specific allowance is made for it in the Bills of Quantities. All costs related to overhead services shall be deemed to be included in the tendered rates.

Add the following Payment Item PSDB 8. 3.8 – PSDB 8.3.10:

PSDB 8.3.8 CUT, REMOVE AND DISPOSING OF EXISTING ASPHALT

(LIMITED FREEHAUL)

Unit: m2

The unit of measure for shall be the square metres of asphalt cut, excavated and removed to spoil dumps, in accordance with the instruction of the Engineer.

The tendered rate shall include full compensation for all labour, materials, equipment, plant and all incidentals required for cutting the asphalt surfacing, irrespective of the thickness, excavating the material, loading, transporting (limited freehaul), off-loading and placing the material in approved spoil dumps. The tendered rate shall also include all cleaning, making good (i.e. re-cutting required to provide straight edges) and prepping for reinforcement.

Payment will not distinguish between the various depths of cutting required and should form part of the tendered rates. No overhaul on this item shall be payable.

PSDB 8.3.9 CUT, REMOVE AND DISPOSING OF EXISTING CONCRETE

(LIMITED FREEHAUL)

Unit: m2

The unit of measure for shall be the square metres of concrete cut, excavated and removed to spoil dumps, in accordance with the instruction of the Engineer.

The tendered rate shall include full compensation for all labour, materials, equipment, plant and all incidentals required for cutting the concrete surfacing, irrespective of the thickness or whether the concrete contains reinforcement, excavating the material, loading, transporting (unlimited freehaul), off-loading and placing the

material in approved spoil dumps. The tendered rate shall also include cleaning, making good and prepping for reinstatement.

Payment will not distinguish between the various depths of cutting required and should form part of the tendered rates. No overhaul on this item shall be payable.

PSDB 8.3.10 EXTRA OVER ITEM 3.2.1 EXCAVATE BY HAND IN SOFT MATERIALS

WITH HAND TOOLS

Unit: m3

The unit of measurement shall be the cubic metre of soft material excavated by hand, using hand tools, such as picks and shovels, only.

The rate shall cover the cost of labour, tools and equipment for excavating by means of hand tools within the authorized dimensions as specified in 8.3.2, for depth up to and including 1,5m. The rate for hand excavation shall be paid as extra over for the rates tendered in item 8.3.2.

PSDB 8.3.11 EXTRA-OVER ITEM 3.2.1 FOR STABILISING BACKFILL WITH CEMENT AND COMPACTION TO 93% MOD AASHTO Unit: m3

The unit of measurement shall be the cubic metre of stabilized approved backfill material, the quantity of which shall be determined in accordance with the authorized dimension of the backfill treated as instructed by the Engineer.

The rate for stabilising backfill shall be paid as extra over the rates tendered for backfilling as per items 3.2.1. The rate of stabilization agent used will be 2% - 4% depending on the nature of the soil available. This stabilized backfill must be compacted to 93% Mod AASHTO as called for under item

8.3.3.3. The rate shall include full compensation for all material, plant, tools and labour necessary for supplying the stabilised & compacted backfill, including the cost of supplying the cement. The cement to be used shall be CEM II 32.5, or as otherwise approved by the Engineer in writing. The extra compaction effort to obtain 93% Mod AASHTO density will be measured under item PSDB 8.3.3.3.

PSDB 8.3.14 EXTRA OVER ITEM 3.13 FOR SUPPLYING NEW PAVING BLOCKS Unit: m2

The unit of measure for item (a) and (b) shall be the square metre of paving blocks supplied to site, to replace broken/damaged blocks removed as instruction of the Engineer. The items shall be paid as extra over item for item PSDB 8.3.13. The cost of reinstatement shall not form part of this item, and shall be paid for in item PSDB 8.3.13.

The tendered rate shall include full compensation for procuring, furnishing, transporting and off-loading of new blocks at positions required along the site, for type specified and to match existing blocks being replaced.

PSDB 8.3.15 REINSTATE CONCRETE SLAB, CLASS 25/19 Unit: m2

The unit of measure for the item shall be in square meters of concrete slab, up to a depth of 150mm, and in accordance to the specifications of item PSDB5.9.7, reinstated to match the existing concrete removed.

The tendered rate shall include full compensation all labour, plant, material and equipment required to reinstate concrete slabs, with class 25/19 concrete, including all construction joints, imprint, colouring, immediately after construction work on that portion / stand is complete, to original state.

PSDB 8.3.18 REINSTATE EXISTING WALLS & FENCES, FOR THE FOLLOWING TYPES:

3) Brick walls and support columns, complete with brick-force as required **Unit: m2**

(a) Palisade fencing and support posts **Unit: m**

(b) Wire fencing **Unit: m**

The unit of measurement for item (a) shall be the square metre of brickwork rebuilt, calculated from the leading dimensions of the brickwork, for the thickness authorized. Areas in walls occupied by conduits, shall not be included in the areas measured, and corners and intersections common to more than one brick wall shall be measured only once.

The unit of measurement for items (b), (c) and (d) shall be the metre length of walls or fence removed, complete with support posts, and re-erected to its original standard and in its original position.

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 fibreboard, 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/m ³

Joints between rubber waterstops must be vulcanized according to a heat-process; pressure, temperature and time being strictly controlled. Vulcanizing must be done with the prescribed equipment, strictly according to the manufacturer's specifications.

3) PVC WATERSTOPS

PVC waterstops must have the following characteristics:

Density	:	1300 kg/m ³ (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 levelled 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 of all aggregate 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 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 trowelled 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 3 **MATERIAL**

PSGA 3.2 **CEMENT**

PSGA 3.2.1 **Applicable Specifications**

Substitute G 3.2.1 with the following:

Only ordinary Portland cement (OPC) and pulverised fly ash (PFA.) shall be used in all concrete for this Contract. No other types of cement (e.g. rapid hardening cement, PBFC or milled granulated blast furnace slag) shall be permitted.

Pulverised fuel ash shall comply with the following specifications:

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

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

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

PSGA 3.2.3 **Storage Of Cement**

Add the following to G 3.2.3:

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

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

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

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

PSG 3.4 **AGGREGATES**

PSGA 3.4.1 **Applicable Specifications**

Add the following to G 3.4.1:

Fine Aggregate

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

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

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

Coarse Aggregate

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

The maximum size of aggregate shall be 25 mm in floor and walls and 19 mm in roof slab. Coarse aggregate containing more than 19% (nineteen percent) shale will not be accepted.

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

PSGA 3.5.2 Air-entraining Agents

Substitute G 3.5.2 with the following:

Air-entraining agents shall not be used in concrete.

PSGA 4 PLANT

PSGA 4.5.2 Finish

Add the following to G 4.5.2:

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

PSGA 4.5.3 Ties

Add the following to G 4.5.3:

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

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

PSGA 5 CONSTRUCTION

PSGA 5.1 REINFORCEMENT

PSGA 5.1.3 Cover

Substitute G 5.1.3 with the following:

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

PSGA 5.2 FORMWORK

PSGA 5.2.1 Classification of Finishes

Add the following to G 5.2.1:

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

(a) Rough

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

(b) Smooth

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

(c) Special smooth, repaired and rubbed

This shall be for formed surfaces of structures prominently exposed to public view where appearance is of special importance. Formwork shall only be of approved plywood, approved commercial form board or smooth tongue-and-groove boards, except that in certain cases such as for pre-cast unit's permission may be granted to use steel formwork provided that sufficient vibration is used. After defects have been repaired, as described in paragraph (e), all ridges, nail marks and other projections shall be removed with carborundum stone. After the treatment the surface shall then be kept continuously wet for 10 days after which period of additional curing it shall be allowed to approach surface dryness immediately prior to treatment by sack rubbing in order to secure a degree of suction most favourable for obtaining good bond.

A soft mortar consisting of one-part cement and two parts sand passing the 1,18 mm sieve shall be thoroughly rubbed over the entire exposed surface with clean hessian, completely filling all pits and irregularities. The mortar consistency shall be that of thick cream. At a sufficient interval after the sack rubbing to prevent smearing, but before the mortar hardens, most of the excess mortar shall be removed by rubbing with clean hessian. After the mortar has set for several hours, curing shall be resumed and continued for at least two (2) days. The surface shall then be allowed to become surface dry and in this condition well sanded with no. 2 sandpaper.

(d) Exposed areas

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

(e) Repair of concrete

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

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

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

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

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

PSGA 5.2.2 Preparation of Formwork

Add the following to this Sub-Clause:

The joints between continuous formwork elements shall be closely butted and, where necessary, if undue leakage is expected, the joints shall be caulked, taped or packed with a sealing gasket, all at no extra payment. Paper, cloth or similar materials shall not be used for this purpose.

PSGA 5.2.5 Removal of Formwork

In Table 2 of G 5.2.5.2, substitute "Portland cement and Portland cement 15" in columns 2, 3 and 4 with "CEM 1 Portland cement, delete columns 5 to 10.

PSGA 5.4 PIPES AND CONDUITS

Add the following to G 5.4:

All pipes and specials, which must be installed in the floors and walls of structures, shall be embedded in the concrete during the casting of such concrete. No holes shall be left for the later installation of pipes and specials, without the written approval of the Engineer.

Where such holes have been approved by the Engineer, the Contractor shall be responsible for the grouting-in of such pipes or specials with an approved expansive cementitious grout as specified in PS G 4.5.3, regardless of whether or not these have been supplied by himself. The Contractor shall provide a smooth, dense and waterproof finish around the pipes or specials.

The clear space between pipes of any kind embedded in reinforced concrete and the clear space between such pipes and reinforcement shall at any point be not less than -

- (a) 40 mm, or
- (b) 5 mm plus the maximum size of coarse aggregate, whichever is the greater.

PSGA 5.5 CONCRETE

PSGA 5.5.1.2 Consistency

Add the following under Sub-Clause 5.5.1.2(a):

The slump for concrete to be used in water retaining structures shall not be less than 30 mm and not more than 60 mm.

PSGA 5.5.1.3 Workability

Add the following to this Sub-Clause:

The concrete mix to be used in water retaining structures shall have a water/cement **ratio not exceeding 0,5**.

PSGA 5.5.1.5 Durability

Substitute G 5.5.1.5 with the following:

Concrete shall be so proportioned to ensure that the water/cement ratio does not exceed 0,5 and, to ensure workability, water-reducing admixtures of approved manufacture shall be used in preference to increasing the cement content.

PSGA 5.5.1.7 Strength concrete

Add the following to G 5.5.1.7:

The concrete mix shall be designed by a specialist organization. No concrete shall be placed until the Contractor's concrete mix design has been approved by the Engineer. The concrete shall have a minimum cement content of 420 kg/m³. The Contractor shall submit to the Engineer a statement of the mix proportion proposed, together with a report from the specialist organization, showing the 28-day concrete strength obtained when using the material proposed for the work. The cost of the concrete mix design shall be borne by the Contractor and shall be deemed to be included in the rates for concrete work.

Admixtures may be used to increase the workability of the concrete but only with the express approval of the Engineer and when the details of the active ingredients of the admixture and their effects are supplied to the Engineer for approval before use. No additives likely to impair low permeability of the concrete will be approved. Calcium chloride or admixtures containing chlorides may not be used in concrete for water retaining structures. Other admixtures and constituents may only be used with the approval of, or as specified by the Engineer.

The grade of strength concrete and the maximum nominal size of coarse aggregate for each portion of the works, unless otherwise indicated on the drawings, shall be as follows:

- (a) Mass concrete under floors and foundations 20 MPa/19 mm
- (b) Blinding layers 20 MPa/19 mm
- (c) Encasing of pipes 30 MPa/19 mm
- (d) Strip foundations 30 MPa/19 mm
- (e) Benching and screeds 20 MPa/10 mm
- (f) All Reinforced concrete 40 MPa/19 mm
- (g) All water retaining concrete 40 MPa/19 mm

PSGA 5.5.7 Construction Joints

Add the following to G 5.5.7.1:

Construction joints shall be limited to the minimum and shall only be made in positions as shown on the drawings or in positions as specifically approved by the Engineer. Construction joints between tank bottoms, floors, or wall bases, and the walls standing on them shall not be made flush with the supporting surface, but shall be made in the wall 150 mm above the base. The 150 mm high riser wall shall be cast as an integral part of the bottom, floor or base, i.e. the concrete in the riser shall be deposited simultaneously with the concrete in the

bottom, floor or base adjacent to it. Where there is a fillet at the bottom of a wall, the construction joint shall be made 150 mm above the fillet.

A PVC water-stop without centre bulb shall be installed at all construction joints in walls of water retaining structures. The size of the water-stops shall be 150 mm in walls thinner than 200 mm and 200 mm in walls of 200 mm thickness and more, or as indicated on the drawings.

PSGA 5.5.7.4 Expansion joints

Expansion joints shall be formed in positions and in accordance with details as shown on the drawings. All expansion joints shall be formed with an approved closed cell polyethylene fill material with a density of not less than 100 kg/ m³, or as otherwise specified. Joint sealers shall consist of a two-component polyurethane sealing compound complying with SANS 1077. Rearguard S-type PVC water stops with centre bulbs shall be installed under floors and Hydrofoil PVC water stops with centre bulbs in walls, as shown on the drawings.

All sealants, fill material and water-stops shall be installed strictly in accordance with the specification of the manufacturers and to the satisfaction of the Engineer. The sealant shall be installed in one operation and jointing to already hardened sealant will not be permitted.

All expansion joints shall be provided with approved bond breaker tape between the fill material and the sealant.

PSGA 5.5.7.4.1 Filled Joints

Filled joints shall be accurately formed to the dimensions shown and with the filler material specified on the drawings. The filler shall be secured in position so that it will not be displaced during or after concreting if the filler is to remain permanently in the joint.

Wherever polystyrene or a similar material which is susceptible to damage is used to form joints, it shall be lined with a hard surface on the side to be concreted. The hard surface shall be sufficiently resilient to ensure that the joint and surfaces can be formed free from defects.

PSGA 5.5.7.4.2 Sealing of Joints

(a) General

Sealed joints shall be made watertight over the full length of the joints, unless otherwise permitted by the Engineer, and the joint dimensions shall be as shown on the drawings.

(b) Preparation of joints

The reaming of joints by sawing or other means shall be undertaken when edge spalling or ravelling can be avoided and shall be subject to the Engineer's approval. After removal of the temporary filler material or the breaking-out of the excess concrete, the inside faces of the joint shall be wire-brushed or grit-blasted to remove all laitance and contaminants. Thereafter the joint shall be cleaned and blown out with compressed air to remove all traces of dust. Solvents shall not be used for removing contaminants from concrete and porous surfaces.

Care shall be taken to ensure that primers or adhesives are applied only to surfaces that are absolutely dry. The primer or adhesive shall be applied strictly in accordance with the manufacturer's instructions. Unless otherwise specified, the primer shall be applied within the temperature range of 10 °C to 40 °C and the sealant shall be applied after the curing period of the primer and within the period during which the primer remains active.

(c) Sealants

Sealants shall be applied strictly in accordance with the manufacturer's instructions by a person skilled in the use of the particular type of sealant. The trapping of air and the formation of voids in the sealant shall be avoided. The sealant shall be finished to a neat appearance flush with the edges of the concrete or to the specified depth.

Thermoplastic hot-poured sealants shall not be poured into the joints when the temperature of the joint is below 10°C. The safe heating temperature shall not exceed the specified pouring temperature by more than 10°C.

Two-part thermosetting chemically curing sealants shall not be applied after expiry of the specified pot life period, which shall commence once the base and activator of the sealant have been combined.

(d) **Water-stops**

(i) **General requirements**

The water-stops shall be supplied in unjointed standard production lengths. Site jointing shall be limited to the absolute minimum. Where lengths in excess of the standard production lengths are required, such longer lengths shall preferably be factory jointed.

At intersections, transitions and abrupt changes of direction, factory-moulded watertight junction pieces shall be used so that any site jointing can be restricted to simple joints. When a water-stop with a centre bulb is intersected, the centre bulb shall be continuous throughout the intersection irrespective of the make-up of the intersection.

Plasticized, flexible PVC water-stops shall be manufactured from high-quality virgin material and shall not contain any scrap or reclaimed material. The water-stops shall be light coloured so as to reduce heat absorption when exposed to sunlight.

The water-stops shall be precision moulded or extruded to the required cross-sectional profile, they shall be free from porosity or other imperfections, and shall be provided with eyelets so that they can be securely fixed to prevent displacement during concreting.

All joints shall be butt-jointed hot-welded joints. Where joints cannot be factory made, Site joints shall be made in accordance with the manufacturer's instructions with equipment prescribed or supplied by the manufacturer and approved by the Engineer.

PSGA 5.5.9 Adverse Weather Conditions

Add the following to G 5.5.9.1:

No material having a temperature of below 5°C shall be used for concrete, and no concrete shall be deposited when the ground or air temperature is below 2°C. Furthermore, if the air or ground temperature is likely to fall below 2°C within 12 (twelve) hours after depositing of concrete, no concreting shall be done without the written consent of the Engineer. If such consent is given the Contractor shall heat the aggregate stockpiles and mixing water, and defrost the formwork and reinforcement.

PSGA 5.5.10 Concrete Surfaces

Add the following to G 5.5.10.1:

Concrete surfaces under screeds, granolithic floor finishes or benching, and surfaces of strip foundations and footings shall be brought up to a plane, uniform surface with a suitable screed board.

Add the following to G 5.5.10: PS G 5.5.10.4 **Wood-floated finish**

Where wood floating is specified or scheduled, the surface shall first be given a finish as specified in G 5.5.10.1 and after the concrete has hardened sufficiently, it shall be floated to a uniform surface free from trowel marks. The screeded surface shall be wood-floated, either by hand or machine, only sufficiently to produce a uniform surface free from screed marks.

PSGA 5.5.10.5 Steel-floated finish

Where steel floating is specified or scheduled, the surface shall be treated as specified in PS G 5.5.10.4 except that, when the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, the screeded surface shall be steel-trowelled under firm pressure to produce a dense, smooth, uniform surface free from trowel marks.

PSGA 5.5.11 Watertight Concrete

Add the following to G 5.5.11:

All structures shall be deemed to be water retaining, unless otherwise specified.

PSGA 5.5.11.1 Requirements and tests for water-tightness of structures

The completed structure shall be watertight, and the quality and finish of the work shall be such that no after-treatment of the work such as plastering or cement wash is necessary to ensure compliance with this requirement.

The works will not be certified complete until the structures enumerated in PS G 5.5.11 has been proved by testing to be watertight.

Upon completion of construction and when so agreed by the Engineer, the structure shall be filled by the gradual admission of water until the water level reaches the designed maximum level. The water level shall then be carefully noted and recorded by the Engineer in relation to a fixed bench mark, and the structure shall be allowed to remain filled for a period of 2 (two) weeks or such longer time as may be required to permit complete saturation of the concrete. During this period, readings will be taken by the Engineer and the results so obtained will be available for the information of the Contractor.

At the end of this period more water shall be added, if necessary, to bring the water level back to the designed maximum level and the water shall be left undisturbed for a period of at least 4 (four) days during which time the level shall again be recorded by the Engineer at regular intervals. The structure shall be considered to be water-tight if the drop in water level does not exceed 6 mm in 96 (ninety six) hours in the case of a roofed structure and if no leakage is apparent.

The acceptable drop in level in the case of an unroofed structure shall be such that it allows for normal evaporation during the time of the test.

If appreciable leakage is evident at any stage of the filling or testing or if, in the opinion of the Engineer, the degree of water-tightness is unsatisfactory, the Contractor shall, when so ordered by the Engineer, discontinue the test immediately and at his own expense take approved steps to rectify the work. The work of rectification shall be continued assiduously until, on repetition of the test procedure, a satisfactory test result is obtained, and the degree of water-tightness is acceptable.

Backfilling around structures shall not commence until a satisfactory test result has been obtained.

The Engineer shall have the right to retest the structure before the expiry of the defects liability period and the results of these tests will be made available to the Contractor. If these tests indicate to the Engineer that the degree of water-tightness is unsatisfactory, the Engineer (before issuing the final certificate) will be entitled to order the Contractor to rectify the work at his own expense in such a manner as will cause least interruption of

the water supply to consumers and will ensure that the degree of water-tightness of the structure is satisfactory.

PSGA 5.5.13 GROUTING

Add the following to this Sub-Clause:

PSGA 5.5.13.1 Materials

- (a) Water. Water for grout shall comply with the requirements given in Sub-Clause 3.3 of SANS 1200 G.
- (b) Aggregates. Notwithstanding the requirements of Sub-Clause 3.4.1 of SANS 1200 G, the grading of fine aggregate (sand) and coarse aggregate (stone or pea gravel) shall conform to the gradings given in Tables 1 and 2, respectively, below.
- (c) Cement. Cement shall be ordinary Portland cement complying with SANS 471.
- (d) Admixtures. Admixtures shall comply with the requirements of Sub-Clause 3.5 of SANS 1200 G and shall have a proven record of satisfactory performance under conditions encountered in the Republic of South Africa.
- (e) Proprietary grouting materials. Unless otherwise approved by the Engineer, proprietary grouting materials shall be obtained ready mixed in sealed pockets as supplied by the manufacturers.

TABLE 1 – SAND		TABLE 2 - STONE OR PEA GRAVEL	
1	2	1	2
Test sieve nominal aperture size, mm	% Passing (by mass)	Test sieve nominal aperture size, mm	% Passing (by mass)
9,75	100	9,5	100
4,75	95 - 100	4,74	95 - 100
1,18	45 - 65	2,36	0 - 5
0,3 (300 μ m)	5 - 15		
0,15(150 μ m)	0 - 5		

PSGA 5.5.13.2 Preparation and procedures

- (a) Before a machine or structural bedplate is placed on the concrete the following steps shall be carried out:
 1. All defective concrete, laitance, dirt, oil, grease, and loose material shall be removed from the concrete foundation by bush-hammering, chipping, or other means until sound clean concrete is obtained. The surface of the foundation shall be scabbled, but shall not be so rough as to interfere with proper placing of the grout. All foundation bolt sleeves shall be cut out, or cut off flush if the sleeves cannot be removed. The top of the foundation shall be re-shaped if necessary.

2. The underside of each steel base, particularly in the bearing areas, shall be cleaned and any burrs and ragged edges removed before the base is placed in its final location.
 3. All holding-down bolt sleeves shall be thoroughly cleaned of any materials that may prevent the grout from flowing freely to the bottom of the bolt sockets.
- (b) The base shall be properly aligned and levelled and shall be maintained in that position during grouting.
- (c) After the machine or structural bedplate has been placed the following precautions shall be observed:
1. Shimming shall be kept to a minimum. Steel plates shall be used for packing and shall be ground to the required thickness, where necessary.
 2. Before grouting is started all loose dirt, oil, grease, and other foreign matter on the surface of the foundation, the undersides of bedplates, and in the bolt holes shall be removed by means of compressed air or other approved means. The surface of the foundation slab shall be thoroughly saturated with clean water, and all free water shall be removed from the surface and the bolt holes just before the grout is placed.
 3. Grouting shall not be carried out until the alignment of all units to be grouted has been checked and approved by the Engineer.
 4. Special care shall be taken with grouting in hot or cold weather to ensure proper setting and gain of strength and, in the case of proprietary grouting materials, by having ice or hot water available, as the case may be, in accordance with the instructions of the manufacturer. Enclosures shall be provided for the grout such that, until it has set, its temperature will be in the range 15-27 °C. Shields to protect the grout from the sun and from hot winds shall be provided by the Contractor when so ordered.

PSGA 5.5.13.3 Formwork

Formwork for grouting shall comply with the applicable requirements of Sub-Clause 5.2 of SANS 1200 G. Forms shall be caulked where necessary. Adequate clearance between forms and bedplates shall be provided to enable the grout to be worked into place.

PSGA 5.5.13.4 Mixing (all free-flowing grouts except epoxy grouts).

The grout shall be mixed to a homogeneous uniform mixture and delivered ready for placing at a temperature between 15 °C and 25 °C.

The materials and water shall be mixed in a mortar mixer for at least 3 min. or, in the case of small jobs only, shall be thoroughly mixed by hand, the entire mass being turned over enough times to ensure even distribution of its components.

The mixing shall be done as close as possible to the place(s) where the grout is placed. No more grout shall be mixed at any one time than can be placed in a period of 20 min. After the grout has been mixed it shall not be re-tempered by the addition of water.

PSGA 5.5.13.5 Grouting (all free-flowing grouts except epoxy grouts).

The grout shall be placed quickly and continuously to avoid the undesirable effects of over-working. (These effects are segregation, bleeding, and breaking-down of initial set). The method of placement shall be subject to approval. The means of placing the grout shall be such that the grout will completely fill the space to be grouted, will be thoroughly compacted, will be free of air pockets, and will have evenly distributed contact over an area in excess of 80% or, in the case of expanding grout, 95% of the bearing area of the item to be supported.

Wherever practicable, grout shall be placed from one side only and where this is not practicable, care shall be taken to ensure that any entrapped air is released.

After the grout has taken its initial set,

- (a) the forms shall be removed;
- (b) excess grout shall be so cut away as to leave a smooth and neatly finished job;
- (c) except where the grout is intended to provide resistance to side thrust, all edges shall be trimmed at 45° to the vertical, from the bottom edge of the bedplate; and
- (d) all excess grout on or about the bedplates shall be removed.

Damage to paintwork, if any, shall be repaired within 24 hours. Packing plates, shims, and other levelling devices shall remain in position.

PSGA 5.5.13.6 Dry-packed grout (standard dry sand and cement grout).

Dry-packed grout shall have a minimum compressive strength at 28 days of 20 MPa. The quantity of water added after placing shall be kept to a minimum consistent with placing conditions, and the cement, sand and, where applicable, pea gravel proportions by mass shall be as follows:

- (a) Where the clearance between bedplate and foundation is 25 mm or less: 1 part of Portland cement and 2 parts of sand;
- (b) where the clearance exceeds 25 mm: 1 part of Portland cement, 1 part of sand, and 1 part of pea gravel.

Dry-packed grout shall be rammed by means of tamping rods against formwork placed along three sides of the bedplate.

PSGA 5.5.13.7 Non-shrink grout with metallic aggregate.

The manufacturer's instructions shall be observed when non-shrink grout with metallic aggregate is used.

Where the clearance between the bedplate and the foundation is less than 50 mm a sand-based mix shall be used. Where the clearance exceeds 50 mm the Engineer may order a mix with a base of sand plus pea gravel to be used.

PSGA 5.5.13.8 Expanding grout with powdered aluminium additive.

The manufacturer's instructions shall be observed when an expanding grout with powdered aluminium additive is used. Where the clearance between the bedplate and the foundation is less than 25 mm, a sand-based mix shall be used.

Where the clearance exceeds 25 mm the Engineer may order mix with a base of sand plus pea gravel to be used.

Each batch shall be mixed for at least 6 min. after the powdered aluminium has been added. Where a ready-mixed grout is used, the powdered aluminium shall be added at the placing site and the batch mixed as specified in PSG 9.4. Grout shall be placed within 45 min. after the addition of the powdered aluminium.

The Contractor shall not use powdered aluminium additive when the ambient temperature is below 5°C.

PSGA 5.5.13.9 Epoxy grout (epoxy mortar type only).

The manufacturer's instructions shall be observed when an epoxy grout is used.

PSG 5.5.13.10 **Testing** (Clause 7). The Contractor shall, where so ordered, carry out a site test for each grouting procedure and each grouting gang to be used. The tests shall be carried out on a dummy bedplate similar in configuration to that which is to be grouted, but not exceeding 1 m in area unless otherwise ordered.

When the dummy bedplate is dismantled, the underside shall show a minimum grout contact area of 80% with reasonably even distribution of the grout over the surface grouted except that, in the case of expanding grout, the minimum grout contact area shall be 95%. The test shall show evidence of good workmanship and materials and the results shall be to the satisfaction of the Engineer.

The Contractor shall, when so ordered, make standard test cubes from various grout mixtures and subject them to compression tests to determine whether the specified strength has been achieved. Test procedures shall comply with the relevant requirements of Sub-Clause 7.2.1 to 7.2.3(f) SANS 1200 G.

PSGA 5.8 NO-FINES CONCRETE

PSGA 5.8.1 Materials

Cement shall be CEM II.

Water and aggregate shall comply with the requirements of G 3.3 and G 3.4.

Each size of aggregate shall be a single size aggregate graded in accordance with SANS 1083.

PSGA 5.8.2 Classes of No-fines Concrete

No-fines concrete shall be classified by the prefix NF and the size of aggregate to be used. Class NF 19 means a no-fines concrete with a 19 mm nominal size aggregate.

The volume of aggregate per 50 kg of cement for each class of concrete shall be as follows:

CLASS AGGREGATE PER 50 kg CEMENT

NF 38 0,33 m³

NF 19 0,30 m³

NF 13 0,27 m³

PSGA 5.8.3 Batching and Mixing

Cement shall be measured by mass or in full pockets of 50 kg each and aggregate shall be measured by volume in approved measuring boxes or barrows.

The aggregate shall be moist or wetted before the cement is added. Where drum mixers are used, about 20% of the water shall be poured into the drum before the aggregate and cement are loaded. The mixing time in the drum shall be about 45 to 50 seconds.

The quantity of water added shall be just sufficient to form a smooth grout which will adhere to and completely coat each and every particle of aggregate, and which is just wet enough to ensure that, at points of contact of aggregate, the grout will run together to form a small fillet to bond the aggregate together. The mix shall contain no more than 20 litres of water for every 50 kg of cement.

Mixing shall be done in an approved batch-type mechanical mixer, but small quantities may be hand mixed.

PSGA 5.8.4 Placing

No-fines concrete shall be placed in accordance with the procedure approved by the Engineer. It shall be placed in its final position within 15 minutes of having been mixed.

The concrete shall be worked sufficiently to ensure that it will completely fill the space to be concreted and that adjacent aggregate particles are in contact with one another. Excessive tamping shall be avoided and the concrete shall not in any circumstances be vibrated.

PSGA 5.8.5 Protection

All no-fines concrete shall be protected from the elements and loss of moisture. Protection against loss of moisture shall be accomplished by one or more of the following methods

- a) Retaining formwork in place;
- b) Covering exposed surfaces with sacking or other approved material kept continuously wet;
- c) Covering exposed surfaces with plastic sheeting.

No-fines concrete placed during cold weather shall be adequately protected against frost for at least three (3) days.

PSGA 5.9 JOINING NEW CONCRETE TO EXISTING

Where partial demolition is required for extension work to existing structures, the contact face shall be cut to predetermined line and level, and any loose and fragmented material shall be removed, and projecting steel cleaned and bent as directed by the Engineer. Where partial demolition is not required but extension work only, the contact surface shall be scrubbed and cleaned of all dirt and loose particles. If dowels are required, they shall be installed in holes drilled into the existing structure, in accordance with the details shown on the drawings, and secured by means of an approved type of epoxy bonding compound such as Epidermix 372 or similar.

Fresh concrete shall be bonded to the old concrete with an approved type of epoxy bonding compound, such as Epidermix 344 or similar.

PSGA 6 TOLERANCES

PSGA 6.2.2 Concrete Surfaces

Add the following to G 6.2.2:

The top surface of the circular tank walls shall be finished to Degree of Accuracy I in G 6.2.3(d)7, but there shall be no abrupt changes in the continuous surface. Deviations shall be measured as set out in G 6.1.2(a).

PSGA 8 MEASUREMENT AND PAYMENT

PSGA 8.1 MEASUREMENT AND RATES

PSGA 8.1.1 Formwork

Delete "or the plan size of the excavation where additional excavation is provided to facilitate erection of forms" in the first sentence of PS G 8.1.3.1(c). Delete the following in G 8.1.1.3(c):
"and for different prop heights for beams and slabs".

PSGA 8.1.3 Concrete

Delete "or the plan size of the excavation where additional excavation is provided to facilitate erection of forms" in the first sentence of PS G 8.1.3.1(c).

Add the following to PS G 8.1.3.1(d):

Strip foundations and encasement of pipes shall be cast directly against the sides and bottoms of excavations. No payment shall be made for additional concrete in over-break. Delete the full stop at the end of G 8.1.3.3(a) and add the following: "and special steps necessary before depositing concrete during cold weather, as prescribed in PS G 5.5.9".

PSGA 8.2 SCHEDULED FORMWORK ITEMS

PSGA 8.2.5 Narrow Widths Unit : m

Substitute G 8.2.5 with the following:

Narrow widths of formwork shall not be measured separately, but shall be included in G 8.2.1 and G 8.2.2, as applicable, unless a specific item has been allowed for in the schedule of quantities.

Add the following to G 8.2:

PSGA 8.2.7 Chamfers exceeding 20 mm x 20 mm, Grooves and Rebates Unit : m

The size of chamfers, or the width and depth in the case of grooves and rebates, is stated.

PSGA 8.4 SCHEDULED CONCRETE ITEMS

PSGA 8.4.4 Unformed Surface Finishes Unit : m²

Add the following to G 8.4.4:

The concrete surface finishes under screeds, granolithic finishes or benching as prescribed in PS G 5.5.10 shall not be measured separately. The rates for the related concrete items shall also cover the cost of these surface finishes.

PSGA 8.4.7 Concrete Complete with Formwork and/ or Trowel Finish Sum or m³

The rate shall cover the cost of the provision of concrete (made from ordinary Portland cement, unless otherwise scheduled), mixing, testing, placing, compacting, the forming of stop-ends and unforeseen construction joints, striking-off or levelling as applicable, trowelling and curing and repairing where necessary, together with the cost of all parts of formwork in contact with the concrete and the necessary bearers, struts, and other supports, plus the layout and plant necessary to erect and strike such formwork.

PSGA 8.5 JOINTS Unit : m

Add the following to G 8.5:

Only construction joints with PVC water-stops shall be measured separately. The cost of all other construction joints shall be deemed to be included in the rates for the relevant concrete items.

The cost of all construction and expansion joints shall include formwork, joint filler and sealer as well as water-stops where applicable.

PSGA 8.7 GROUTING

Add the following pay items:

- (a) Grouting in of equipment supplied and installed by the plant supplier
 - (i) using non-shrink grout (state type) Unit: cubic metre (m3)
 - (ii) using dry-packed grout Unit: cubic metre (m3)

The unit of measurement shall be the cubic metre of completed grouting. The tendered rate shall include full compensation for supplying of all materials, mixing, applying and finishing to a steel-float surface finish after installation of the plant.

Add the following pay items:

Add the following Payment Items PSGA 8.9 and PSGA 8.10, including sub items:

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 3CR12 (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 paint 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 intermediate 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 within the treatment works

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	$\leq 0.1\%$ when immersed in water at 23°C for 100 days	SANS 1117	Per Project
Cathodic disbondment of Duplex system	Disbondment length $\leq 15\text{mm}$ after 28 days	SANS 1117	Per Project
Tensile strength of sleeve at yield	$\geq 10\text{ MPa}$	ASMT 882	Per Project
Tensile strength of sleeve at break	$\geq 20\text{ MPa}$	ASMT 882	Per Project
Elongation of sleeve at break	$\geq 500\%$	ASMT 882	Per Project
Adhesion to Steel of duplex system	$> 2\text{ N/mm}$	SANS 1117	Per Project
Density of sleeve	$> 915\text{ kg/m}^3$	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	$> 1.5\text{ N/mm}$ 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 Denso 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)	Q_{max} (Q_s)
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				m ³ /h	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 kilolitres (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	(To be attached)

straight pipe lengths and compliance with this specification):	
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 (Q_s) 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:	<i>(To be attached)</i>
Meter specification sheets (including head loss across meter, minimum upstream/downstream straight pipe lengths and compliance with this specification):	<i>(To be attached)</i>
Test certificate:	<i>(To be attached)</i>

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 331, Vedoc V VPC 2001 or similar approved.

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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;
- Meter box 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.

PSL 8.2.11 Anchor/Thrust Blocks and Pedestals

Unit : m³

Substitute L 8.2.11 with the following:

The concrete shall be measured net volume to the specified width and depth in excess of the external volume of the pipe (i.e. the volume of the pipe will be deducted). The rate shall cover the cost of formwork and concrete.

ADD THE FOLLOWING NEW SUBCLAUSE:

PS L 8.2.16 Potable Water Sampling Points

Unit : No

The rate provided by the contractor shall include the complete manufacturing, supply and installation of potable water sampling points in strict accordance with the approved construction drawings. The final position of sampling points are to be confirmed on-site with the Employer's Agent prior to manufacturing, supply and installation.

ADD THE FOLLOWING NEW SUBCLAUSE:

PS L 8.2.17 New Infrastructure Tie-In to Existing Infrastructure

Unit : Prov. Sum

The Contractors shall provide the Employers Agent with two separate rates which shall cover the complete cost of isolating, cutting, excavation (up to 2 m deep), bedding, dewatering and exposing the existing main at the connection point, supply necessary fittings for under pressure connections for the section of the mains as required, temporary support, safety precaution backfilling and the removal of surplus and unsuitable material. Repair and making good of damaged coatings and linings to be included.

The Contractor shall provide the Employer's Agent with the necessary method statements, workshop drawings and general arrangement drawings of all mechanical items to be used as well as cost breakdown of the rates provided for review by the Employer's Agent.

ADD THE FOLLOWING NEW SUBCLAUSE:

PS L 8.2.18 QA and QC by Third Party Inspector

Unit : Prov. Sum

The Contractor shall provide three separate rates (with rate breakdowns) for the implementation of a quality control and quality assurance plan on all manufactured/ordered mechanical items for the duration of the project by a suitably qualified and registered third party inspection authority.

The responsibilities of the third party inspection authority shall in a broad sense be to inspect and approve mechanical items and to provide the Employer's Agent with originals of all quality control related documentation for:

- Inspection of mechanical items at the manufacturing facilities
- Inspection of mechanical items on-site and prior to the installation thereof

Inspection of mechanical items on-site and after the installation thereof

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”.

PSLB 8.2 SCHEDULED ITEMS

PSLB 8.2.1 Provision of bedding from trench excavations

DELETE THIS SUB-CLAUSE AND REPLACE WITH THE FOLLOWING:

Without the need for screening or other treatments:

- | | | |
|----|----------------------------|----------|
| a) | Selected granular material | Unit: m3 |
| b) | Selected fill material. | Unit: m3 |

The rates shall cover the cost of acquiring, from any point along the trench excavation as be Selected by the Engineer within 5,0 km, bedding that complies with the relevant requirements of the specification, of delivering it to points alongside the trench spaced to suit the Contractor's methods of working, and of disposing of displaced material within a free haul distance 5,0 km.

Including for screening and/or other treatment:

- | | | |
|----|----------------------------|----------|
| a) | Selected granular material | Unit: m3 |
| b) | Selected fill material. | Unit: m3 |

The rates shall cover the cost of screening by means of mesh sieves or otherwise treating excavated material, at any point along the trench excavation as may be selected by the Engineer, in order to produce bedding that complies with the relevant specification, delivering it to points along the trench, within 5,0 km, spaced to suit the Contractor's methods of working, of making good any backfill deficiency there may be from points where screened backfill material has been acquired, and of disposing of displace material within a free haul distance of 5,0 km.

PSLB 8.2.2 Supply only of bedding by importation

PSLB 8.2.2.3 From commercial sources (Provisional)

ADD THE FOLLOWING SUB-SUBITEM TO THIS CLAUSE:

- (c) Special bedding material

-
- | | |
|-------------------------------|--|
| 1) Description of material... | Unit: m ² or m ² |
| 2) Etc. for other items | |

The unit of measurement shall be the square metre or cubic metre of material as specified.

The rate shall cover the cost as specified for (a) and (b).” The rate shall include the cost of acquiring from commercial sources, transporting regardless of distance, off loading and placing in the trench bottom clean where ordered by the Engineer.

ADD THE FOLLOWING SUB-SUBCLAUSE:

PSLB 8.2.6 Compaction Test

Compaction testing using the troxler method...	Unit: No
--	----------

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."

PSLE 8.2 SCHEDULED ITEMS

ADD THE FOLLOWING ITEMS:

PSLE 8.2.14 CONNECTION TO EXISTING STORMWATER

AMEND THIS SUBCLAUSE TO READ:

a. New Stormwater Pipes to Existing Manholes Unit: No

The rate shall cover the cost of breaking into the existing manhole, grouting in the new pipe, demolishing and reforming the benching as required, sealing all new joints for water tightness, removal of all building rubble from the manhole and dealing with the water flow during the tie-in operations.

PSLE 8.2.15 Sub-soil Drains

a. Excavate subsoil pipe trenches Unit: m³

Excavate by machine in all materials for subsoil pipe trenches and use for embankment or backfill or dispose, as ordered.

b. Supply and place Bidim A2 filter cloth, or similar geotextile Unit: m

Supply and install complete, as indicated on the drawings in trench.

c. Supply, handle and install high strength rigid slotted HDPE perforated subsoil drainage pipe.

i) 110mm

Unit: m

ii) 160mm

Unit: m

d. Supply and place 19mm concrete stone

Unit: m³

e. Construct brick drainage junction boxes

Unit: No

PSLG PIPE JACKING (SANS 1200 LG – 1983)

PSLG 2.3 DEFINITIONS

Add the Sub-Clause :

The Works shall mean all the features making up the entire jacking operation including construction of both thrust and reception pits as well as the excavation placing and jacking of the pipes together with all support activities.

PSLG 3 MATERIALS AND WORKMANSHIP

PSLG 3.1 PIPES FOR JACKING

Delete the Sub-Clause and substitute with the following:

Pipes for jacking shall be SC type reinforced concrete manufactured in accordance with SANS 677 : Concrete non pressure pipes as published in General Notice 463 of 9 July 1982 to the D load specified on the drawings. All pipe joints shall be sealed. The actual diameters of the pipes shall not be less than the nominal diameters given on the drawings or stated in the schedule.

In addition to withstanding the specified two (or three), edge bearing test-load, the pipes shall be capable of withstanding, without damage during jacking, the maximum longitudinal force to be transmitted by the Contractor's jacks and method of operation.

The design of the pipes shall be determined by the Contractor to suit the proposed method of construction but shall not be less than the class of pipe or type of pipe stated on the drawings or determined by the Engineer. The pipes shall incorporate extended modified Ogee type joints which shall be seated by means of a rubber ring. On the longer pipe jacks it may be necessary to use a rebated butt joint to withstand the higher jack forces. However, the decision of type of joint to use is that of the Contractor. Irrespective of joint type used the Contractor must adhere to the joint sealing details given in PSLG 3.1.2 below.

At least one hole shall be formed in the crown of each pipe to allow for the injection of both a lubricant, if required, and a final grout. The final layout of grout holes is the Contractor's responsibility.

The Contractor must ensure that the pipes shown on the drawings and mentioned in the documents can be jacked the full distance mentioned in the Scope of Work.

PSLG 3.1.1 Intermediate Jacking Pipes (New Sub-Clause)

In circumstances where it is desirable to use jacking pipes intermediate between manholes or junctions the number and type of such intermediate jacking pipes is to be determined by the Contractor. The joint between pairs of intermediate jacking pipes shall be protected externally by a cylindrical mild steel sleeve of wall

thickness at least 8mm, which shall overlap the pipes on either side of the joint for a distance of at least 150 mm. The joint is to allow a substantial and permanent caulked seal within the joint.

PSLG 3.1.2 Joints and Seals (New Sub-Clause)

It is the Contractor's choice as to type of joint used in the pipes to be jacked. However, applied forces used to jack the pipes must be uniformly distributed around the joint to avoid damaging the joint. Pipes that are delivered to site with damaged joints must be rejected by the Contractor.

A seal is required at each joint to minimise ingress of water. Ingress of water into the jacked pipes starting from the joints should not exceed 5 litres per minute in total. The chipboard packing used to distribute stresses on the joints should be raked out to a depth of 25 mm on the inside all round and sealed with a durable flexible sealing agent such as bituseal, thioflex or similar.

PSLG 5 CONSTRUCTION

PSLG 5.1.1 Authority to Jack Pipelines under Roads and Railway Lines

The Employer will obtain permission from the relevant authorities for jacking under roads and railway lines. However, the Contractor is to confirm that such permission has been granted before commencing work.

PSLG 5.1.2 Competence

Jacking and excavation shall be supervised and undertaken by persons fully conversant with this work. (Clause 21 and 22 of the GCC 2015).

PSLG 5.1.4 Contractor Solely Responsible

Add to the Sub-Clause:

No approval of any material or plant and its operation, or of any construction procedure to be used will imply any relaxation of the requirements governing the quality of the materials or of the finished work or relieve the Contractor of his/her responsibilities under the Contract.

PSLG 5.2.3 Recording Movements

PSLG 5.2.3.1 General

Delete the Sub-Clause and substitute with the following:

The Contractor shall take movement measurements correct to 1,0 mm of any change in the line and level of road and railway line before the start of the contract and at such intervals as directed by the Engineer for a period up to 12 months after issue of the Completion Certificate. However, no more than 15 sets of reading will be required in this period. A copy of these measurement records shall be made available to the Engineer.

PSLG 5.2.3.2 Working under roadways

Add to the Sub-Clause:

The Contractor shall bear full responsibility for any consequential damage to persons and property resulting from subsidence.

PSLG 5.2.3.3 Working under railway lines (New Sub-Clause)

Before jacking under railway lines the Contractor shall take elevation readings at the top (Crest) of the fill embankment and at the toe of the ballast as well as on top of each railway line along the centre line of the pipe jack and at intervals of 1 500 mm apart up to a distance of 9m from the pipe centre line. The profile of the

railway embankment must be measured and recorded from toe to toe (of the embankment) before pipe jacking starts.

The intervals at which movement readings are to be taken over a period of 12 months is the same as mentioned above for roads.

PSLG 5.2.3.4 Remedial measures (New Sub-Clause)

All remedial measures will be carried out and completed to the standards set by the various controlling authorities.

Roads – remedial measures plus time related professional costs needed to reinstate roads and fill embankments will be the Contractor's liability.

Remedial measures are those relating to the need to put right settlement and movement of road surfaces, formation layers or fill embankments including providing all road safety markers, traffic control, or signs and all associated needs of the road authority to allow remedial work to proceed without danger to workers or traffic. The Contractor must arrange all matters regarding remedial work with the road authority. In most instances these measures will comprise jacking up concrete roads using grout and regrading to original elevation formation layers and premix surfacing as well as mending drainage fixtures where these have been damaged. All the remedial work will be directed by the Engineer to his/her satisfaction and approval.

Railways – remedial measures plus time related professional costs needed to reinstate railway lines and fill embankments will be the Contractor's liability.

Remedial measures are those relating to the cost of realigning railway lines, regrading of ballast, and stabilising fill embankments. All the remedial work will be directed by the Engineer to his/her satisfaction and approval. A provisional sum is given in the Bill of Quantities to cover the cost of strapping railway lines and provided for a signalman to activate speed deregulation.

PSLG 5.4 EXCAVATION

PSLG 5.4.1 General

Except as required in terms of 5.2.5 SANS 1200 LG 1983 the provisions of SABS 1200 DA shall apply.

PSLG 5.4.2 Thrust Pits

In the second paragraph, delete the words "Factories, Machinery and Building Work Act, 1941 (Act 22 of 1941)" and replace with the words "Occupational Health and Safety Act 1995"

Add to the Sub-Clause:

Claims arising out of any accidents or incidents in or adjacent to these access pits will not be considered by the Employer.

Storm water control measures around these pits are also necessary to prevent water ingress into the pits. Provision must be made by the Contractor to keep both thrust and reception pits free of seepage and storm water.

Thrust pits will in general only be permitted at positions indicated on the drawings or where manholes or junctions are required. Jacking pits shall be of sufficient size to accommodate the jacking operation and any manhole structure to be constructed upon completion of the jacking. The approximate dimensions of the pits shall be agreed with the Engineer before work commences. The Contractor will be required to design and construct all thrust blocks, bases and other temporary works required to maintain the stability of the pits and shall demolish and remove these upon completion of the jacking operation and the Contractor shall take into account all such limiting factors when preparing his/her tender.

PSLG 5.4.2.1 Intermediate Jacking Pits (New Sub-Clause)

In circumstances where it is desirable to use jacking pits intermediate between manholes or junctions indicated on the drawings, the number and type of such intermediate jacking pits is to be determined by the Contractor. Such intermediate jacking pits will only be permitted where conditions of access and working space permit.

Full details of the intermediate jacking pits and the junction box constructed as a closure between the ends of the jacked pipes are to be submitted with the tender.

PSLG 5.4.3 Jacking of Pipeline**PSLG 5.4.3.1 General Add to the Sub-Clause:**

A lead pipe with a rebated front end over which the trailing end of the shield is fitted should be the first concrete pipe used. This should minimise over-break. No material may be removed in advance of the leading edge of the shield in unstable or loose materials.

As the pipe is advanced, excavation is to take place within the lead pipe under the full time supervision of a responsible foreman to ensure that the end of the shield is always fully plugged with earth at a safe angle of repose within the pipe. The Contractor shall ensure that there is not uncontrolled flow of sand, mud or earth into the pipe which could result in imperiling excavation personnel or the formation of cavities above or around the sleeve pipe. If at any stage during the jacking operation such conditions arise the Contractor shall immediately plug the pipe and stabilise the material before proceeding with further work.

Should it be necessary, the Contractor shall allow for stabilising the soil by dewatering, chemical grouting, or any other approved means. The design of the shield shall be such as to permit the face to be completely or partially closed by boarding or similar to control material flow from the face.

During weekend or holiday stoppages the Contractor must make sure that a plug of soil is left in the shield.

PSLG 5.4.3.6 Continuous Jacking (New Sub-Clause)

In order to minimize problems due to the build-up of skin friction on a static pipe, the pipes are to be jacked continuously unless agreed to otherwise with the Engineer, allowing for overnight stoppage.

PSLG 5.5 JACKING PROCEDURE**PSLG 5.5.1 Procedure**

Add to the Sub-Clause:

Each jack shall be fitted with a pressure gauge suitable calibrated such that the actual jacking forces can be read at any time.

Suitable packing of hard materials shall be inserted between the abutting vertical ends of the pipes in order to transfer the jacking force. The packing shall constitute a complete circle and be sufficiently wide to transfer the applied load.

A suitable adjustable shield is to be fitted to the front of the lead pipe. The shield is to incorporate cutting edges which can be varied by control jacks to maintain the pipe on line and level.

Pipe jacking may generally be carried out either up-grade or down-grade to suit the Contractors requirements subject to the approval of the Engineer, and provided that provision is made by the Contractor for the necessary drainage required.

PSLG 5.5.2 Lubrication of Structure during Jacking

Add to the Sub-Clause:

To ease pipe friction, the Contractor shall make provision for the injection of bentonite or other approved lubricant.

PSLG 5.6.1 Backfilling (New Sub-Clause)

Both thrust and reception pits must be backfilled using the removed material. Backfill compaction rates must not be less than 90 percent Modified AASHTO with the top 1,5 m of backfill being compacted to a minimum 92% Modified AASHTO. The backfill must be built up to at least 500 mm above the natural ground level to prevent stormwater pounding around the excavation pits.

PSLG 5.7 GROUTING AND PLUGGING

Add to the Sub-Clause:

In soft material the grout shall consist of cement/bentonite with a compressive strength of 5 MPa at 28 days. In rout shall consist of cement/sand with a compressive strength of 25 MPa at 28 days.

PSLG 6 TOLERANCES AND MEASUREMENT

PSLG 6.2 Permissible Deviations

In the first line delete "100 mm" and substitute with "50 mm".

PSLG 6.4 MEASUREMENT (NEW SUB-CLAUSE)

Throughout the jacking operation the Contractor is requested to take and record the following measurements.

- a) A plot of pressure (kN/m²) and total force (kN) originating from the combined force of all hydraulic jacks used to move pipes versus accumulative length of jacked pipe. As soon as a lubricant is used it must be recorded on the plot. If heavy ground water seepage is noted this must also be recorded on the plot. A time scale in days should also be used in conjunction with jacked length of pipe. It is also important to record start up force required to move pipes after a delay, i.e. after weekend.
- b) The dimensions of the thrust block used must be recorded as well as the accumulative thrust force on the block (kN) together with lateral movement of the thrust block (mm).

PSLG 8 MEASUREMENT AND PAYMENT

PSLG 8.2.2 & PSLG 8.2.3 Supply and Install Pipes by Pipe Jacking Method, Complete with Excavations

Add to the Sub-Clause:

The rate shall include for grouting any voids around the pipe annulus which are a result of the pipe jacking operation.

PSLG 8.2.10 Standing Time for Pipe Jacking Gang and the Jacking Equipment

In the first paragraph, delete the words "Wage Act, 1957 (Act 5 of 1957)" and replace with the words "Basic Conditions of Employment Act No. 75 of 1997".

PSLG 8.2.12 Permanent Sealing

The unit of measurement will be cubic meter of pipe from open end to open end.

The rate will include all labour, equipment and materials to rake out and place a flexible seal in the pipe joints.

PSLG 8.2.13 Brick Wall Closure

The unit of measurement will be the number per pipe diameter.

The rate shall cover all labour, materials and equipment used to construct the brick ends at the opening of all pipes.

PSLG 8.2.14 Geotechnical Investigation

- a) Allow provisional sum for additional geotechnical investigation for pipe jacking purposes where ordered by the engineer (Prov.) Unit: Prov. Sum
- b) Contractors mark-up on Item

ERF CONNECTIONS (WATER)

PSLF 5 CONSTRUCTION

Add the following to Clause PSLF 5.8:

PSLF 5.8 BACKFILL

Since erf connections are in general laid under roads, cement stabilization and compaction to 93% of the backfill will not be separately measured. The rate tendered for the HDPE pipe work must include for the cement stabilization and extra compaction to 93% Mod AASHTO.

PSLF 7 TESTING

PSLF 7.1 GENERAL

The contractor shall test the erf connection pipes to 180 m head of water.

PSLF 8 MEASUREMENT AND PAYMENT

PSLF 8.2.2 SUPPLY, LAY AND TEST ERF CONNECTIONS

Replace the second paragraph with the following:

The rate shall cover the cost of providing the pipes, connecting to the saddle, laying in light sandy material, jointing, and testing.

Erf connections must be constructed in accordance with the detail drawing issued. Saddles are measured separately under item 8.2.3. The limit of construction for each erf connection provided shall be the existing water meter.

PSLF 8.2.3 EXTRA-OVER ITEM 8.2.2 FOR SPECIALS

Add the following to Clause 8.2.3:

The rate shall include connecting to the water main for saddles, and providing ferrules.

Add the following Payment Item PSLF 8.2.9 - PSLF 8.2.11:

PSLF 8.2.9 CONNECTING OF COMMUNICATION PIPE AT EXISTING WATER

METER POINTS Unit: No.

The unit of measurement shall be the number of old erf connections disconnected and removed from the existing water meters, and new erf connections connected to existing water meters including cutting and threading of existing pipes, as required. The disconnection and connection to the existing water meter will only be measured once.

The rate shall include all labour, materials and equipment required to supply the above mentioned connections. Excavations and backfilling shall be measured separately.

PSLF 8.2.10 TRANSFER EXISTING BULK WATER METER CONNECTIONS TO REPLACEMENT PIPELINE INSTALLED, FOR PIPELINE WITH OD:

(I) 110mm Unit: No.

(II) 160mm Unit: No.

(III) 200mm Unit: No.

The unit of measurement shall be the number of bulk water meters, irrespective of their diameter, transferred to the new replacement pipelines installed, for the diameters as specified, complete with the necessary saddle and pipework required.

The rate shall cover the cost of all labour, equipment and materials, providing the necessary pipework and saddle, excavation, connecting to water main, laying in light sandy material, jointing, backfilling, testing and and work necessary to make a serviceable bulk connection.

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.

PSME 8 **MEASUREMENT AND PAYMENT**

PSME 8.3.3 **CONSTRUCT SUBBASE WITH MATERIAL FROM COMMERCIAL**

SOURCES

Unit: m3

Add the following to Clause 8.3.3:

The unit of measurement shall be the cubic metre of subbase constructed and will differentiate between the different thicknesses required.

Add the following to the end of Clause 8.3.3:

No extra-over rates shall apply to work in restricted areas such as, for example, the widening of existing fills or to existing pavements, or repair, excavation or backfilling within the boundaries of an existing road carriage-way. The only exceptions shall be those for which explicit provisions are made in the Scope of Works specifications and the Bill of Quantities.

Allowance for work in restricted areas shall, under normal circumstances, be deemed to be included in the rate tendered for each item of work concerned. Such rates shall include for all extra measuring and setting-out; all manual work of whatever nature; double handling of material; special methods of excavation, application, placing, mixing and compacting; as well as all extra and/or special supervision, labour, equipment, tools, transport and incidentals over the above those usually required for work in normal working areas.

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.

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: OSHA 1993: HEALTH AND SAFETY SPECIFICATION
- PC: ENVIRONMENTAL MANAGEMENT SPECIFICATION
- PD: EPWP REQUIREMENTS
- PG: STERILISATION OF TANKS AND RESERVOIRS
- M_p PROJECT SPECIFICATIONS - M - MECHANICAL WORKS
- PS ELECTRICAL & INSTRUMENTATION PROJECT SPECIFICATION

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 “**sub-contractor**” 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 OSHA 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) Tunnelling (Regulation 13)

The Contractor shall comply with Regulation 13 wherever tunnelling 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)
- 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.
 - 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.
 - 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.)
 - Transplanted plants shall be pruned to limit transpiration. Plants shall also be sprayed with an evapotranspiration retardant liquid if they are evergreen.
 - 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
- Aloes, succulents and evergreen bulbous plants may be transplanted at any time of the year.
 - Aloes and bulbous plants shall be planted in similar conditions and to the same depth as they were before they were removed.
 - 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 storm-water 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 specifications 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.
- PD.3.3 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.
- PD.3.4 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 accredited 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.

PART M_P: PARTICULAR SPECIFICATIONS - MECHANICAL

M_P1 GENERAL

Margate WWTP is a combination of three (3) treatment trains. Treatment train 1 & 2 were refurbished under phase 1 of the upgrading program.

In the specifications, duties and products (or similar products) are specified to obtain the best quality products for the works. The Tenderer is however not restricted to any product specified and must check and offer products with a quality that complies with the SANS or international applicable standard.

The Tenderer must verify all given duties for compatibility with a certain product offered. Should the Tenderer offer a product that differs from the flows and duties specified he must clearly indicate this in his offer that the Engineer can adjust the process parameters or to reject the specific product offered. Certain products from well-known manufacturers with a proven track record will definitely get preference over inferior, unproven or not to standard products.

M_P2 SCOPE OF WORK

This section provides a summary of the mechanical items required for this contract. More detailed description of items and specifications are provided in the individual item sections in the document.

M_P2.1 Inlet Works (TT3)

- A mechanical raked inclined bar screen, 304L stainless steel, with 8 mm openings between bars
- Centreless screw conveyor complete with drive motor and gearbox
- Mechanical screening press complete with drive motor and gearbox
- Dewatered screenings skip collector bin
- Pipework and connections at screw conveyor & screening press
- An open canal Ultra-sonic level detector with flow data transmitter
- TT2: An open canal Ultra-sonic level detector with flow data transmitter

M_P2.2 Blower Room

- 3 x 55 kW Rotary lobe blowers with filters & silencers

- 316L Stainless steel outlet pipework to manifold with pressure gage, blow of valves, NRV & temperature cut out sensor
- Cross air flow fans for colling

MP2.3 Aerobic Reactor

- Replace 200 mm Ø vertical & floor mounted header pipework in both reactors
- Replace air distribution pipework with aeration domes
- If possible, use the same pipe saddle floor fixing holes
- 2 x Dissolved oxygen probes with self-cleaning action complete with controller, enclosure and stainless-steel mounting arms with transmitter to view and record the dissolved oxygen concentration

MP2.4 Sedimentation Tanks (17 m Ø)

- 2 x 3CR12 Steel rotating half bridge with handrails, 316L stainless steel vertical stanchions and echelon scraper plates. **Spira scraper blade configuration**
- 2 x Rotary peripheral drive wheel with electrical motor and gearbox unit
- 2 x 316L Stainless steel scum draw-off unit with outlet control unit
- 2 x 316L Stainless steel circumference weir baffle plates
- 2 x 313L Stainless steel circumference v-notch overflow weirs
- 2 x Slip ring unit
- 2 x 316L Stainless steel centre half bridge bearing and slip ring pipe support
- 2 x 304L Stainless steel tank bottom incoming pipework
- 2 x 304L Stainless steel tank bottom RAS pipework
- 2 x 304L Stainless steel tank bottom was pipework

MP2.5 Sludge Re-circulation & sludge draw-off Pump Station (RAS & WAS)

☼ RAS pumps:

- 3 x Self-priming sludge re-circulation pumps complete with electrical motor and base plate frame (RAS pumps - s-recirculation)
- 3 x 316L Stainless steel suction pipework with supports, valves & gauges (150 Ø)
- 3 x Hot dipped galvanized steel outlet pipework (up to 3 m outside PS) with supports, valves & gauges

MP2.6 Chlorine Dosing Building & Chlorine Contact Canal

- Chlorine room 2 - Correctly rated vertical shaft multi-stage ejector booster pump
- Chlorine room 2 - Mounted aspirator type injector to produce the vacuum to draw the gas from the chlorine cylinder
- Chlorine room 1 - Vacuum demand valve, mounted to chlorine gas cylinder
- Chlorine room 1 - A Chlorine gas flow meter (Rota-meter) with calibrated flow measurement indication marking in a tube arrangement.
- Safety equipment:
 - ☼ Approved chlorine wall charts
 - ☼ First aid cabinet

-
- ☠ Full face piece self-containing breathing apparatus
 - ☠ Gas leak detector
 - ☠ Outside of building emergency water spray tap (foot operated) for face and hand washing
 - Automatic chlorine dosing start-up or shut down from treated effluent flow detection switch

M_P2.7 **WAS dewatering**

- ☼ Sludge balancing storage tank
 - Mixer on storage tank
- ☼ VOLUTE® dewatering press
 - 2 x Model GS – 302 presses
 - 2 x Positive displacement sludge feed pumps

M_P2.8 **Electrical Switchgear Building**

- Standby generator included in Electrical Engineering specification & SoQ

M_P2.9 **Electrical work:**

- Electrical engineering specification & SoQ

M_P3 **REFERENCE TO PRODUCT BRANDS**

Please refer to **M_S4** in the Standard Specification

M_P4 **REFERENCE TO STANDARDS & ABBREVIATIONS USED**

M_P4.1 **Abbreviations**

☼ **Process Design**

- AADDWF : Annual Average Daily Dry Weather Flow
- AADWWF : Annual Average Daily Wet Weather Flow
- AADPF : Annual Average Daily Peak Flow
- BNR : Biological Nutrient Removal
- MLSS : Mixed Liquor Suspended Solids
- RAS : Return Activated Sludge
- WAS : Waste Activated Sludge
- FBDA : Fine Bubble Diffused Aeration
- (s)-recycle : Sludge Recycle (RAS)
- (a)-recycle : MLSS Recycle

☼ **STANDARDS Institutes**

- AFBMA : Anti-Friction Bearing Manufacturer's Association
- AGMA : American Gear Manufacturer's Association
- AISI : American Iron and Steel Institute
- ANSI : American National Standards Institute
- ASTM : American Society for Testing and Materials
- ASME : American Society of Mechanical Engineers
- AWS : American Welding Society

•	BS	:	British Standards Institution
•	NEMA	:	National Electrical Manufacturer's Association
•	SANS	:	South African National Standards
•	SIS	:	Swedish Institute of Standards
•	DIN	:	Deutsch Industry Norman
•	ISO	:	International Organization for Standards
•	SAECC	:	South African Electrolytic Corrosion Committee

Mp4.2 Applicable STANDARDS

SANS 10400	:	National Building Regulations
BS 5304	:	Code of Practice for Safeguarding of Machinery
SANS 9096 - 1	:	Testing of Welders (where applicable)
BS 292 Part 1	:	Dimensions of Ball Bearings, cylindrical & Spherical Roller Bearings
SANS 10162 - 4:		Structural use of Steel Part 4: Design of Cold Form SS structural
SANS 10044 - 3:		Welding Part 3: The Fusion of Steel (& SS): Test for Welding Procedures
SANS 10044 - 4:		Welding Part 4: The Fusion of Steel (& austenitic SS): Test for the Approval of Welders where working without Procedure Approval Requirements
SANS 10064	:	The Preparation of Steel Surfaces for Painting
SANS 10104	:	Hand Railings & Balustrading - (Safety)
SANS 10341	:	Installation & Maintenance of bearings - General Guidelines
SANS 1700 - 5 - 9	:	Fasteners Part 5: General Requirements & Material Properties Section 8: Corrosion Resistant SS Fasteners - Bolts, Screws & Studs
SANS 1700 - 5 - 10	:	Fasteners Part 5: General Requirements & Material Properties Section 8: Corrosion Resistant SS Fasteners - Bolts, Screws & Studs
ISO 281	:	Rolling Bearings - Dynamic Load Ratings and Rating Life
BS EN 10139	:	Carbon Steel, Plate & Strip
BS EN 1564	:	Austempered Ductile Cast Iron
BS EN 13835	:	Austenitic Cast Iron
BS EN 10088-1 :		304 Stainless Steel
BS EN 10088-1 :		316 Stainless Steel
BS EN 10028-2 :		4130 Heat Treated Alloy Steel
BS EN 10028-2 :		4140 Heat Treated Alloy Steel
BS 970: Part 3 805M20: 8620 Case Hardening Alloy Steel		
BS EN 1982	:	Leaded Bronze CC493K
All material hardness's measured to Rockwell C (HRC)		

MP5 DETAILED SPECIFICATION

MP5.1 Inlet Works

.1 Inclined Mechanical Front Rake Screen

☼ Description

- The front-raked bar screen shall be fitted with multiple raking bars fastened to endless chains and sized to suit the 700 mm wide inlet canal. Actual screen width $\pm$ 550 mm.
- The screen shall be 15° inclined to the vertical

☼ Duties

- Flow to WWTP = 126 l/s = PWWF. Total flow (3 x AADDWF) is currently pumped to the WWTP from PS 4A (info is that only 1 pump @ 95 l/s is currently used with 30% of the incoming flow supposed to drain down to TT1 & TT2)
- Venturi backwater flow depth at screen when flow is 126 l/s is 650 mm
- The soft solids in the sewage will be slashed to fine suspended material by the action of the pump impeller. In general, accepted for stringy material that passes through the pumps the solids will generally be very fine
- The maximum velocity through the screen openings shall be 1.0 m/s
- The minimum velocity through the screen openings shall be 0.6 m/s
- The screen shall be designed for a life expectancy of 12 years under the ambient conditions on site
- The screen shall be suitable for operation for 365 days a year and 24 hours/day

☼ Description of Screen Components

• Frame

The frame housing and side plates shall be manufactured entirely from 4.5 mm thick plates and will accommodate the scraping mechanism, chain guides and idler sprockets.

The side plates, back/beach plate and structural components shall be a fully welded construction. On the upstream side of the screen, face cross members shall be securely welded to the side plates at regular intervals between a point above the maximum top water level and the head of the screen. The cross members shall also serve as support for removable covers.

Easily accessible and removable covers are incorporated on both sides of the screen for chain inspection and checking of wear and tensioning purposes.

• Sole Plate

The sole plate shall be of a design shape to direct screenings and debris onto the lower portion of the screen bars and to prevent any accumulation at the base of the screen. A 50 mm drop in the canal floor is allowed at the point where the sole plate shall be fixed to the floor. This will allow that the leading edge of the sole plate will be level with the canal invert.

• Screen Bars

Screen bars shall be of tapered cross section (minimum 8 - 4 mm tapered) and 40 mm deep. The screen bars shall extend to a point at least 100 mm above maximum top water level.

The screen bars shall be accurately set, easily removable and set at a spacing so that the **clear opening** between bars is **8 mm**. The screen bars shall be solidly secured by means of laser cut retention plates that are bolted to the sole plate and back/beach plates.

- **Raking Mechanism**

The screen shall be periodically raked by a mechanized rake system which shall be controlled by a timing device and also adjustable for continuous operation.

A scraper cleaning mechanism at the top of the travelling rake shall remove the screenings collected by the rake. The moving rakes shall be suspended between two side chains, which shall be driven by means of a head shaft and sprockets.

Raking bars and tines shall be of sufficient depth to ensure complete stiffness across the full width of the bar. The bar shall have a minimum thickness of 10 mm and must have tines that are profiled to suit the screen bar spacing of 8 mm. Tines shall penetrate 15 mm from the leading edge of the screen bars and have a maximum gap of 5 mm between the leading edge of the screen bar and the base of the raking tines.

A mechanism shall be incorporated to enable correct tensioning of the drive chains and accurate positioning of the raking bars across the screen face without the need to dismantle any part of the screen frame and without the need of any special tools.

- **Rake Cleaning Mechanism**

The rake cleaning mechanism shall comprise of a single bar fitted with hinged side arms and a synthetic wearing edge that engages, and efficiently cleans the full width of, each raking bar as it rises above the upper edge of the back/beach plate.

Raking bars shall be directly and securely attached to the drive chains at appropriate centers (**minimum 4 raking bars**) by the use of long pins through the applicable rollers.

- **Discharge Chute**

A top mounted discharge chute shall guide the screenings to discharge into the screening's conveyor.

- **Chains, Sprockets, Shafts and Bearings**

Chains and sprockets shall be sized to ensure low wear and a 12-year operating life.

The chains shall be of the 'conveyor' type with extended links to provide a roller center distance of 125 mm. Chain guide angles shall accurately guide the chains between the sprockets and shall be fastened to the 4.5 mm thick side plates.

Drive and idler sprockets shall be laser cut and profiled to suit the chain and rollers. A centrally positioned hub shall be continuously welded to the sprocket on both faces.

The drive sprockets shall be keyway mounted on a common drive shaft while the idler sprockets shall be mounted on stub shafts and incorporate synthetic self-lubricating bushes.

The top drive shaft shall be mounted between two spherical type bearing units. The bearing units shall be mounted in an adjustable take-up arrangement to provide proper tensioning of the drive chains between the sprockets. Easily accessible greasing points for the bearings shall be provided.

Bottom idler stub shafts shall be mounted on bases that are securely fastened to the side plates.

- **Drive unit**

The drive unit shall be a hollow shaft geared motor and shall be mounted on the upper drive shaft. The drive unit shall be suitably sized with a maximum rotational speed of 8.5 rpm. The drive unit must be fixing system must be able to accommodate adjustment along the 15° inclined axis.

- ✱ **Materials of Construction and finish**

Refer to the Standard Specification Ms for stainless steel welding and treatment

- Frame housing & side plates : Grade 304L stainless steel.
- All structural members : Grade 304L stainless steel.
- Cover panels : Grade 304L stainless steel.
- Chute : Grade 304L stainless steel.
- Screen bars and retention plates : Grade 304L stainless steel.
- Raking bars and tines : Grade 304L stainless steel.
- Cleaning mechanism : Grade 304L stainless steel.
- Cleaning blade : UHDPE
- Chain guides : Grade 304L stainless steel.
- Sprocket material : Grade 304 stainless steel
- Chain rollers : Ertalyte or similar
- Chain links : Grade 304 stainless steel.
- Drive unit : To comply with Ms & Es Spec
- Drive shaft : Grade 304 stainless steel.
- Idler stub shafts : Grade 304 stainless steel
- Idler sprocket bushing : Vesconite or similar

- ✱ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the mechanical screen, for approval by the Client's representative on site

- ✱ **Testing**

- a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

- b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified

- ☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine
- c) **After commissioning**
 - ☑ Monitor and record all data & performance for the specified test & trial period

.2 Centreless Screw Conveyor

☼ Description

- The screenings generated by the mechanical screen will drop via the mechanical screen outlet chute into the hopper inlet side of the screw conveyor. The screw conveyor shall be fitted in a U-shape canal with the canal sealed on top from the inlet hopper side and be driven by a single geared motor drive. The conveyor shall be mounted on a braced frame with two (2) A-frame legs, with castor wheels at each leg end for travel on a rail. The wheels shall be locked in place by means of locking pins. The locking cleat plates with locking pin holes shall be spaced to lock the frame in the operation position as well as the end of the rail travelled way length.

☼ Duties

- Flow to WWTP = 136 l/s = PWWF. Total flow (3 x AADDWF) is pumped to the WWTP. Due to the pumped flow, there will be far less screenings or trash in the inflow compared to gravitational flow due to the cutting and shearing action of the pump impeller. For the purpose of this tender trash content in the wastewater can be taken as 100 to 150 l/Ml of inflow
- The screw conveyor shall be design for a life expectancy of 12 years under the ambient conditions on site
- The screw conveyor shall be suitable for operation for 365 days a year and 24 hours/day

☼ Description of Screw Conveyor Components

• U - Tube Canal and Cover Plate

The body plate for the canal shall be minimum 4.5 mm thick. The cover plate can be 3 mm thick and the cover plate securing bolts spaced at no more than 245 mm. The U-tube shall be secured to the leg framework by means of 'n' U shape flange welded to the tube section and the flange shall be secured at the bottom to a rectangular carrier plate secured to the frame. The U shape flange and rectangular carrier plate shall have a minimum thickness of 4.5 mm.

An inside liner should be installed in the U-tube. The liner shall consists of a polymer, featuring a two-colour laminate design to act as a wear check indicator.

At the outlet end the U-tube shall be fitted with a flexible rubber chute to prevent splashing of screenings into the hopper of the screw compactor. The U-tube cover plate at the outlet shall be easily accessible and removable.

• Centerless Screw

The plate thickness used for the helical screw shall be a minimum of 20 mm for the outside helix and 16 mm for the inside helix.

The conveyor shall be driven by direct coupled motor & gearbox. The drive end of the screw shall have a solid flange to be bolted to the gearbox output shaft flange.

- **Screw Conveyor Support Frame**

The support frame shall be designed by a professional engineer to comply with the maximum allowable bending & shear stresses, deflection tolerances and torsion stress.

- ✱ **Materials of Construction and finish**

Refer to the Standard Specification Ms for stainless steel welding and treatment

- All bolts & fasteners : Grade 304 stainless steel
- U-tube & mounting flanges : Grade 304L stainless steel
- U-tube cover panels : Grade 304L stainless steel
- All structural members of support frame : Grade 304L stainless steel
- Support frame wheels & locking pins : Grade 304 stainless steel
- Screw conveyor : Grade 304L stainless steel
- Rails : 3CR12 steel
- U-Tube liner : Polymer (2 colour)
- Drive unit : To comply with Ms & Es Spec
- Drive shaft : Grade 304 stainless steel.

- ✱ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the screw conveyor, for approval by the Client's representative on site

- ✱ **Testing**

- a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

- b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified
- ☒ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☒ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

- c) **After commissioning**

- ☒ Monitor and record all data & performance for the specified test & trail period

☼ **Description**

The screenings press must be suitable for dewatering and compacting screenings containing paper, rags, plastic, fecal matter and other hydrous materials.

The screenings compactor/dewatering press shall consist of a two-stage screw dewatering press, the first stage compression and dewatering with a hopper and water outlet shout and the second stage the compactor and final dewatering stage. After the compacted and dewatered screenings passed through the second stage an outlet enclosed chute shall carry the screenings to an outlet above the screenings collection bin.

☼ **Duties**

As previously indicated, all sewage flow to the WWTP is pumped flow and the amount of screenings expected is far lower than from gravitational sewage flow.

For design purposes the screenings are taken as 0.015 m³/Mℓ of incoming sewage flow.

☼ **Description of Screenings Compactor/Dewatering System**

- **Drive unit**

A heavy-duty geared motor unit installed at the inlet end of the press shall rotate the screw compactor.

Additional seal protection shall be provided between the gearbox output shaft and the screw chamber to eliminate the ingress of liquid.

- **Screw chamber**

The screw chamber shall be of a tubular construction, flanged on both ends to suit the geared motor and the discharge chute. The top of the screw chamber is in the form of a lip flange to bolt to a purpose inlet hopper with bottom flange.

Water pipes and spray nozzles shall be secured within the hopper with a designed outlet spray arrangement to wash screenings and prevent to prevent the accumulation of rags and debris on the pipes and spray nozzles.

Slots at the required spacing shall be incorporated in the lower portion of the chamber to allow for the squished-out liquid to drain.

- **Venturi Tube**

At the outlet side of the compression chamber, the diameter around the screw shall be reduced over the screw to form a venturi effect to further compress and dewater the screenings. This venturi section should be replaceable and adaptable in size to fit the type of screenings produced at the mechanical screen. Replaceable Teflon (Bennox) or durable strips to assist with sliding the compressed screenings forward shall be installed in the compression chamber.

- **Compression and Conveying Screw**

- The screw shall be able to withstand extremely high forces, of robust construction and resistant to warping and bending. The heavy steel blades shall be welded to a solid steel shaft and hard faced at the end within the compression chamber where they are subject to wear.

- The screw shall cantilever from the gearbox output shaft where it shall be mechanically rigidly fixed.

- **Drainage Trough**

A drainage trough shall be provided underneath the screw chamber. The trough shall be at an incline to one end so that the liquid can drain to the lower outlet section where it can be piped away under gravity.

A wash pipe with nozzle holes shall fit inside the bottom of the trough to wash down the bottom of the trough towards the outlet pipe end.

- **Discharge Tube**

A standard inclined discharge tube shall be provided, flanged at one end to bolt to the outlet end of the compression chamber. The lining or inside configuration of the tube shall allow for minimum friction and easy cleaning in case of a blockage. The design and profile of the tube shall be such that dewatered/compacted screenings can be easily discharged into a standard waste container/skip.

- ✱ **Safety and Protection Measures**

- Hard stone, metal pieces and hard wood chips that passes the screens and traps may cause a screw blockage or lock with the associated motor overloading trip.

If overloading occurs, protection measures must be in place, and the press manufacture shall indicates the measures incorporated in the design to automatically cater for these circumstances. These may include auto reverse of the electrical motor and a time delay of a few seconds before resuming a forward motion and the allowable repeat sequence. If the overloading problem cannot automatically be resolved an alarm system should notify the operational staff if not at the screenings press.

- ✱ **MATERIALS OF CONSTRUCTION**

Inlet hopper	:	4.5mm Plate - 304L stainless steel.
Press screw	:	16mm Flights (single start 145mm pitch), 80mm shaft - Mild steel (surface hardened)
Drip tray	:	2mm Plate - 304L stainless steel.
Press body	:	200nb Sch 40 (8.2mm wall) - 304L stainless steel.
Discharge chute	:	200nb Sch 10 (4mm wall) - 304L stainless steel.
Wash water pipes	:	Grade 304 stainless steel.

- ✱ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the screw conveyor, for approval by the Client's representative on site

- ✱ **Testing**

- a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

- b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified

- ☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine
- c) **After commissioning**
 - ☑ Monitor and record all data & performance for the specified test & trail period

4 FLOW MEASURING EQUIPMENT

☼ Equipment Description

An open canal ultrasonic level detector (4 to 20 mA) shall be installed over a side canal box before the venturi-flume with 304 stainless steel holding brackets. The side canal box floor level is ± 100 mm below canal floor level to calibrate the detector for zero flow. The ultrasonic sensor shall be coupled to a flow meter transmitter with 3 x 4A NO/NC potential free contacts.

A data logger with a 4 – 20 mA input and RS 232 interface and minimum 16000 measured values storage capacity shall be installed in the motor control board. The data shall be downloaded to a PC in the control room office for printing and record keeping. The flow measuring equipment shall be from a single manufacturer and Endress & Hauser equipment or similar is preferred.

MP5.2 Rotary Lobe Air Blowers (pressure – vacuum)

☼ Description

- The blower shall be of the positive displacement type with preference to the 3-lobe arrangement and low air delivery pulse system. *The existing electrical equipment & blowers with electrical motors were damaged and the same building will be reused for the replacement blowers.* The new blowers need to deliver slightly more than the old blowers with the only change a 55 kW motor instead of the previous 45 kW motors

☼ Duties

The duty specification shall be related to the following atmospheric data:

- a) Absolute pressure: = 1 013 mbar or 760 mm Hg pressure
- b) Temperature: = 20°C
- c) Relative humidity = 60%
- d) Weight of air = 1.2 kg/m³
- e) Delivery airflow = 1500 m³/hour
- f) Operating pressure = 0.76 bar
- g) Rotary lobe rotating ≤ 1500 RPM

☼ Description of Components

- Bearings
- Lip seal
- Gears
- Oil splash lubrication mechanism

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- Rotors
 - Casing with suction & outlet flanges
 - Shaft
 - Gas seal
 - Casing sides
 - Double inlet filters
 - Pulsating damper and silencer outlet chamber
 - Drive belt if silencer box configuration
 - Vacuum gauge on inlet side & Pressure gauge on outlet side both with shut-off valve for removal and replacing
 - Temperature gauge on outlet side with sensor for motor cutout
 - NRV on outlet side
 - Solenoid valve for startup blow-off with pressure relief valve on outlet side. Pressure relief valve set at 1.2 bar.
 - Outlet isolating valve that can withstand a temperature of 160°C

✱ **Materials of Construction and finish**

Refer to the Standard Specification M_s for stainless steel welding and treatment

- Blower casing : Cast iron to BS, DIN or applicable standard
- End cover panels : Cast Iron
- Rotors & integrated shaft : Cut & grinded SG iron
- Bearings : Reinforce steel rolling type rated for a life span of 100 000 hours
- Gears : Helical tooth synchronizing gear with ground surfaces in volute profile

✱ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the mechanical screen, for approval by the Client's representative on site

✱ **Testing**

a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified

- ☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine
- c) **After commissioning**
 - ☑ Monitor and record all data & performance for the specified test & trail period

MP5.3 **Aeration Air Discs/Domes** (pressure – vacuum)

✴ **Equipment Description**

The supplier & manufacturer of the existing air domes/disks is not known at this stage.

The replacement fine bubble aeration domes shall be of the membrane disk type and not of the previous generation carborundum dome aeration configuration.

The engineer's preliminary calculation of the spacing of the aeration discs indicated ± 660 disks in total in the two aeration basins.

A correct layout drawing of the existing aeration pipework & fine bubble aeration system will be compiled when the civil contractor cleaned out the existing aeration basin

✴ **Aeration Disk Components**

- Main body/support dish with backflow preventor/NRV & Female socket
- EPDM fine bubble aeration membrane
- Screwed-on/or lock-on membrane retaining ring
- Rubber or PVC saddle with U clamp adaptors for fitting to 2", 3", 4" or 90 mm Ø pipes
- Additional material to be supplied with disks

Air piping saddles and floor fixing brackets & bolts

✴ **Preliminary Duties**

Preliminary calculations:

Immersion depth to top of dome = 6.1 m

Airflow rate/dome = 2.5 m³/hour

MP5.4 **MIXERS**

✴ **Design Guidelines for Mixing Equipment**

- All mixing equipment shall be surface mounted.
- Mixing equipment shall be designed to operate satisfactorily under the atmospheric, ambient and other conditions specified in the Project Specifications.
- A single compartment volume is **90 m³** and the liquid depth = **2.0 m**
- The process design makes provision for an SST sludge concentration of 7000 mg/ℓ
- The power input and flow pattern shall be such as to minimize serious mixing to keep the sludge concentration as drawn from the SST's
- The rotation speed of the mixer shaft shall not exceed 20 rpm at the design speed.

- In the event of a power outage, the mixers shall be capable of re-suspending all settled solids throughout the basin and the scouring velocity shall be a maximum as close to the floor as possible.
- Different types of metals shall be isolated from each other to prevent corrosion due to galvanic reaction.
- Periodic stopping and restarting of the mixer's units shall be accounted for in the mixer design and this should not be detrimental to the operation of the mixer's units supplied.
- All mixer turbine impellers shall rotate in the same direction.
- Mixer turbines shall be a single impeller arrangement.

The impeller shall be designed to prevent the undue accumulation of rags and debris material around the shaft at the liquid surface level.

- The mixing energy input for the anoxic tanks = $\pm 3.5 \text{ W/m}^3$. Mixing energy shall be defined as the actual power imparted into the mixed liquor via the turbine by the motor and gearbox assembly.
- The tip speed of the impeller shall not exceed **2.0 m/s**.
- The shape of the mixer blades shall be such as to prevent surface movement, aeration of the mixed liquor and shear forces exerted on the surrounding liquid.
- An anti-vortex baffle or disc shall be incorporated in the turbine design if required to prevent this effect. Tenderers considering adding anti-vortex baffles shall be required to indicate the requirements in their offer to achieve the desired mixing efficiency without any aeration. Full details shall be included in their tender.
- Mixer shaft diameter shall be sufficient to prevent whipping or deflecting of the mixer shaft if rags and fibrous material collect on the shaft or blades. The shafts and bearings design shall allow for the out of balance forces that result from mixer operation at the works.
- Mixer shafts shall preferably be tubular to withstand all forces set up by the turbines and shall be corrosion proofed by means of corrosion resistant epoxy coating in accordance with the tender specification.
- The mixer shaft shall be flanged at one end and designed to prevent any eccentricity when installed in the field. Fitted machine bolts are preferred to join the shafts to the flanges and marking of the respective positions for installation shall be noted during manufacture. Special attention should be paid to the alignment of gear output shaft, drive shaft and mixer impeller. Flanges shall be machined only after all welding has been completed.

The mixer assembly shall be balanced and then aligned after installation and shall not impart any perceptible vibration or undue swaying under operating conditions.

- The deflection limits on the mixer base plate shall be structurally within design limits to prevent any warping or off vertical line rotation of the electrical motor or shaft during operation.

The base plate shall elevate the mixer assembly to facilitate the draining of oil from the gearbox.

- The mixer motors shall be vertical flange mounted. Please refer to electrical specification, E_P, for electrical motor specification

✱ **Materials**

Refer to the Standard Specification M_s for stainless steel welding and treatment

- All bolts & fasteners : Grade 304 stainless steel
- Mixer shaft (tube) : Grade 304L stainless steel - Sch 40
- Mixer shaft flange : Grade 304L stainless steel

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- Mixer impellers ($t \geq 5$ mm): Grade 304L stainless steel - Epoxy coated to Ms
 - Anti-vortex baffles or disks (if required) : Grade 304L stainless steel - Epoxy coated to Ms
 - Mixer baseplate : Steel, hot dipped galvanized & Epoxy coated to Ms
 - Drive unit: To comply with Ms & Es Spec

✱ **Mixer Performance**

- Information should be supplied in the Tender of where and when such equipment has been previously installed. The Tenderer shall also indicate in his tender what mass, torque, radial load, bending moment, AGMA rating and mechanical power and thermal ratings are involved.

✱ **Quality management**

- A quality management plan (QMP) shall be submitted for the design, manufacturer, installation and commissioning of the mixers, for approval by the Client's representative on site

✱ **Testing**

a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified
- ☒ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☒ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) **After commissioning**

- ☒ Monitor and record all data & performance for the specified test & trial period

MP5.5 SPECIFICATIONS GEARBOXES

The Tenderer shall submit with his Tender a catalogue of the make of gearbox offered and indicate how the selection of gearboxes was made.

Unless otherwise stated, the gearboxes shall be directly mounted to the motor. The gears shall be helical gears which are used in applications with high speeds, large power transmission and low noise levels.

Gear drives should be sized to ensure that the running load peak does not exceed the endurance limits of the components.

Gearboxes shall have an efficiency of not less than 96% on two stage reductions and 95% on three stage reductions.

Simple cooling may be by convection from the gearbox casings but without assistance from cooling fins or fans. Adequate other cooling means shall be provided as applicable. The exterior of the gearbox shall be free from dust or moisture traps. Access for inspection purposes shall be allowed for in the design of the gearbox casing. Maintenance free oil lock seals on the high-speed shafts shall be a standard design feature.

The bearing span shall be suitably selected for vertical gearbox application and shall promote shaft support for the intended application. Rigid lateral load distribution shall be by means of a standardized pinioned arrangement reducing noise and vibration.

A rigid half coupling shall be shrunk onto the output shaft of the gearbox and shall be secured by an additional keep plate and bolted connection in a recognized manner.

Substantial eye bolts shall be provided for all reasonable lifting purposes.

The gearboxes shall carry the manufacturer's identification details together with the rated shaft speeds, output power and maximum ambient operating temperature.

The gearboxes shall conform to the relevant British Standards and AGMA ratings with respect to the following requirements:

- (a) The design ambient temperature should be 45°C.
- (b) The noise at 100% of the full output power and 45°C ambient shall not exceed 86 dBA as measured 1 m in distance from the equipment.
- (c) The gearing shall give double the life of the bearings when subjected to similar loadings.

The design of the gearbox should be such that the calculation of the actual radial load divided by the permissible radial load + the actual axial load divided by the permissible actual load shall be ≤ 1 .

Tenderers shall state in their tenders whether external oil fitters, flow and pressure switches are included in their offer.

A stainless steel ball valve and extension drainpipe and plug shall be provided to facilitate oil changes by the maintenance staff. The termination of this drain shall be accessible from the operating platform.

G.1.2 Gears

The gears shall be high efficiency case hardened helical gears and rated in accordance with the AGMA Code of Practice 420.04 for continuous operation. The gears shall be manufactured from high cast iron to BS 1542 Class 220 or an equivalent standard.

Semi-hardened and subsequently machined gears will not be accepted. Pinions shall be manufactured in accordance with AGMA 390.02 Class 12

G.1.3 Service Factor

The service factors indicated in the table below shall be based upon the installed power:

Process Units	Service Factor
Rotating Bridges: Sedimentation & Clarifier Tanks	1.75
Aerators, blowers	2.5
Mixers	2.25
Centrifugal Pumps	2

The rate tendered, by the Contractor, for the supply and installation of all gearbox unit and/or the units scheduled for refurbishment, shall include the mandatory first month's oil replacement in order to uphold the suppliers guaranteed agreement. The rate tendered shall therefore be construed to include the cost of the draining, testing and lubricants.

G.1.4 Bearings

Roller bearings shall be used throughout. Taper roller bearings shall be used to sustain radial and thrust loads. Bearings shall be designed for a design life in excess of the indicated hours in the table below, in accordance with ISO.281. Bearings for the output shaft shall be designed to withstand bending, up thrust, down pull and radial loads imposed by the turbine.

The Contractor shall ensure the lubricant used for the filling and specified in the maintenance manual, is adequate for prolonged operation in ambient temperatures of up to 45°C without overheating.

Process Units	Design Life	Operation
Rotating Bridges: Sedimentation & Clarifier Tanks	L10 for 75 000	Continuous
Aerators & blowers	L10 for 100 000	Continuous
Mixers	L10 for 100 000	Continuous
Centrifugal Pumps	L10 for 100 000	Continuous

G.1.5 Lubrication

The gearboxes shall be constructed with a dry well for the low-speed shaft bearing to avoid complete drainage of oil in the event of an oil seal failure. Provision to monitor the oil level must be provided. The bearing shall be grease lubricated with the greasing point easily accessible.

A stainless-steel ball valve and extension drain pipe and plug shall be provided to facilitate oil changes by the maintenance staff. The termination of this drain shall be accessible from the operating platform.

G.1.6 Gearbox / Motor Coupling

The coupling shall be fully rated to transmit the motor full load power and tested to prove static and dynamic balance. The coupling shall accommodate small axial, lateral and angular misalignments without imposing undue stress on the shaft and bearings. The coupling shall be enclosed in a stationery solid-plate guard to the Engineers' satisfaction.

G.1.7 V-belt

V-belts shall be designed to withstand the high tension and high-power drives, shall be long wearing, tough and trouble free. The V-belt cover shall be oil, heat and ozone resistant in order to protect the inner components. The compression section shall provide excellent gripping action and a high coefficient of friction but shall also allow an initial start-up clutching action in order to eliminate power spikes and excessive bearing loading. The moulded cogs shall provide optimum flexibility with minimal build-up of heat.

G.1.8 Flexible Couplings

Misalignment of the coupling is to be prevented by proper alignment of the coupling by means of a taper gauge or set of feeler gauges and a straight edge or dial indicator. Two types of misalignments are encountered by flexible couplings: Angular misalignment and parallel misalignment. Any adjustment to correct the misalignment in one direction may affect the other direction and both the angular and parallel alignment shall be checked after each adjustment.

A periodic check of the coupling alignment shall be performed.

G.1.9 Housing

The gearbox shall be manufactured high strength cast iron which enables the gearbox to be used in harsh environments. A breather designed to prevent moisture from entering the housing of the gearbox, shall be fitted to each unit supplied under this contract. Breather unit allowing continued oil spillage due to the overfilling of the gearbox shall not be accepted.

Oil level sight glasses (fully protected and UV resistant) shall be provided with levels marked for running and filling minimum and maximum positions respectively. These shall be arranged for easy viewing and shall take into account the angle of mounting.

G.1.10 Shaft

The Input and output shafts shall be of sufficient dimension in order to avoid excessive torsional or bending stresses and deflection. The impeller shall be secured to the shaft in such a way that it can readily be removed without any damage without any damage to the impeller and the shaft.

The shafts shall be protected by replaceable sleeves manufactured from non-corrosive material. The shaft shall be manufactured from stainless steel.

G.2 Proof of maintenance

The period of maintenance will extend over a period of 12 months calculated from the Completion as defined in the Appendix. However, should a portion or all of the plant and equipment fail / or require rectification during this period, the Engineer reserves the right to extend the Period of Maintenance in respect of such portion or all of the plant and equipment for a further period of not more than 12 months calculated from the date of Commissioning of such plant and equipment after rectification.

✱ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the mechanical screen, for approval by the Client's representative on site

✱ **Testing**a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified
- ☒ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%

- ☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) **After commissioning**

- ☑ Monitor and record all data & performance for the specified test & trial period

MP5.6 **SEDIMENTATION TANKS**

✱ **Description of tank**

- The tank is a reinforced concrete circular tank with a conical bottom, sloped vertically to the horizontal 1:8, for sludge being scrapped to a central collection hopper for withdrawal. The tank with the proposed mechanical equipment is shown on drawing J1-183-ST-LAY-001. The tank inside diameter is 17 m and the water side wall depth is 3.5 m

✱ **Sedimentation Tank Mechanical Equipment Specification**

- The inlet pipe entering at the center of the concrete hopper floor, is a 300 mm Ø 316L stainless steel pipe class 40 Sch.
- A rotating half bridge shall be offered with center pivot arrangement and rotation action by means of an electric motor with reduction gearbox fitted to a drive wheel running on the perimeter wall (minimum 250 mm thick) of the sedimentation tank. The bridge shall be supported by a hinged bearing at the inlet structure. A structural 3CR12 steel ladder frame, fully cross-braced with handrails shall be rigidly fixed by means of welds to the outer end of the bridge for access purposes.
- The following sizes and live design loads are applicable
 - 1) Designed Load: 2.5 kN/m² of walkway area
 - 2) Walkway width ≥ 800 mm
 - 3) Hand and knee rails both sides of walkway, $H_{min} = 900$ mm above walkway
 - 4) Kicker plates: 100 x 100 x 4.5 mm attached to both sides of the bridge

The bridge shall be designed to withstand torsion deflection within the specified limits.

The bridge shall furthermore be designed with sufficient camber to completely cancel the deflection which will be produced by the dead load of the complete bridge with the scraper mechanism attached.

- The electric motor through a gearbox shall be rated to give a peripheral speed of approximately 1.5 to 2 meters per minute. On the tank, one rotation of the bridge will take place in ± 26 minutes when the speed is 2.0 m/minute and ± 36 minutes when the speed is 1.5 m/minute
- For the gearbox specification please refer to MP 5.5 in the Standard Specification
- A 125 mm wide (or as offered) wheel with a polyurethane tyre of at least 25 mm thickness must be used for the bridge. The wheel must be accurately aligned.

The driving wheel shall be fitted with a stainless-steel protective cover, which shall be fitted to the end of the bridge, and provided with a front mounted adjustable guard that will push foreign objects off the wall and to the outside thereof. Wheel guards shall be easily detachable and do not form part of the supporting structure.

- The underside of the rotating bridge and the underside of the backing plates for the rubber scrapers shall have sufficient clearance to prevent any touching between metal and concrete when the tyre is worn down.

- The scraper mechanism for the settling tank shall form part of the half bridge to scrape the entire floor area. The scrapers shall be fitted to an underwater support system manufactured from stainless steel 316L which shall be suspended from the overhead rotating bridge.

The scraper mechanism and the bridge shall form one rigid unit on the side of the pivot point with an allowance of at least 30 mm vertical adjustment in the level of the floor scraper.

The scrapers shall be **spiral** Echelon arrangement type and shall be fitted with synthetic rubber squeegees shaped to fit snugly on the floor. The shape of the squeegees shall be such that at any point it will fit the curvature of the conical floor of the basin.

The overall height of the scrapers shall be at least 400 mm and 500 mm at the outer wall and the scrapers shall overlap by at least 10%. Near the central cone the scrapers shall form a spiral in order that the sludge is scraped constantly into the hopper at any bridge position.

- The squeegees are to be fitted to the scrapers by means of a back plate. The squeegees are to be secured 50 mm from the bottom by means of a bolted connection.

The bolt shall pass from the back plate, through the squeegees to the scraper. The squeegees back plate shall be 50 mm in height and have a minimum thickness of 4.5 mm.

- The back plates shall be angled more than 60° to the radius, with a minimum thickness of 5 mm. The underside of the back plates shall be such that at any point it will fit the curvature of the conical floor of the basin.

- A scum removal system to de-scum the liquid surface area with every half bridge rotation shall be installed. Where possible all adjusters shall be above water level. The de-scum mechanism shall comply:

- 1) A manufactured scum board with a minimal dimension of 450 mm deep, 300 mm below surface water level shall be provided along the perimeter of the overflow weir at a distance of 300 mm from the weir and supported by 304L stainless steel brackets adjustable in a horizontal direction.
- 2) A scum skimmer plate shall be provided at least 3 mm thick and 150 mm deep to skim the water surface area within the scum baffle (including the stilling chamber) and a scum receiving hopper shall be installed at the outer rim of the tank. The scum skimmer plate shall be set at an angle to the bridge and supported at short intervals to prevent buckling. The part of the scum skimmer passing over the hopper shall be pivoted and shall be arranged in such a way that it will lift clear of the hopper.
- 3) The scum box opening shall measure at least 1000 mm in a radial direction and 500 mm in the direction parallel to the overflow weir and shall be made from 4.5 mm thick sheet material.

A striker arm shall activate a flap valve, which shall open for at least 10 seconds during the period that the scraper arm is above the hopper. **The striker arm shall be rated to fit with the selected circumferential rotation speed - If 2 m/min then L (striker plate) = ≥ 500 mm, if 1.5 m/min then L (striker plate) = ≥ 350 mm.**

The valve shall preferably consist of a weighted bung capable of shutting off the discharge pipe.

If possible, the length of the striker plate shall be adjustable in order to adjust the de-scumming time.

- 4) A V –notched single overflow weir manufactured of 4.5 mm plate, 200 mm deep shall be provided and installed on the inside of the concrete wall of the launder. The overflow weir is to be attached to the wall of the tank by means of stainless steel bolts.

The installation of the V-notched shall ensure that the effluent discharges freely and evenly around the whole circumference of the tank without leakage through the joint between the weir and the wall or the joints between weir sections.

✱ **Materials**

Refer to the Standard Specification Ms for stainless steel welding and treatment

- | | | |
|--------------------------|---|-------------------------------------|
| • All bolts & fasteners | : | Grade 316 stainless steel |
| • Incoming pipe | : | Grade 316L stainless steel - Sch 40 |
| • Influent stilling well | : | Grade 316L stainless steel |
| • Rotating half bridge | : | Grade 3CR12 chromium steel |
| • Handrails | : | Grade 304L stainless steel Sch 10 |
| • Kicker plates | : | Grade 304L stainless steel |
| • Wheel guard | : | Grade 316L stainless steel |
| • Scraper mechanism | : | Grade 316L stainless steel |
| • Scrapers | : | Grade 316L stainless steel |
| • Back plates | : | Grade 316L stainless steel |
| • Scum board | : | Grade 316L stainless steel |
| • Scum skimmer | : | Grade 316L stainless steel |
| • Scum box | : | Grade 316L stainless steel |
| • Striker arm | : | Grade 316L stainless steel |
| • V notch overflow plate | : | Grade 316L stainless steel |
| • Drive unit | : | To comply with Ms & Es Spec |

✱ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the rotating half bridge with all associated equipment, for approval by the Client's representative on site

✱ **Testing**

a) **Before commissioning**

- ☒ Refer to Standard Specification
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

b) **Commissioning**

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified
- ☒ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%

- ☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine
- c) **After commissioning**
 - ☑ Monitor and record all data & performance for the specified test & trail period

MP5.7 SLUDGE RECIRCULATION PUMPS

.1) Pump Description

- Three (3) self-priming centrifugal pumps, complete with motors, mounting frames and fixing bolts are to be supplied, installed, tested & commissioned for the settled sludge recirculation pumpstation. A Cornell or Gorman Rupp self-priming pump (or other similar specification pump) may be offered.

The pumps shall be of the horizontal self-priming centrifugal solids handling type.

The pumps shall be of standard dimensions, built to limit gauges or formed to templates, such that parts will be interchangeable between like units.

.2) Pump Duties

- Pump delivery (average sludge level in sump) = 21 l/s
- Pump plinth top level = ---
- Top sludge level in sump = ----
- Outlet level at sedimentation tank = ----
- Sludge inlet pipe from sedimentation tank invert level = ----
- Sump floor level = ----
- Inlet level at aerobic tank inlet = ----
- Provisional total head = 14 m

.3) National & International Institute Standards

- Please refer to MP4

.4) Suction and Outlet Pipework

The Contractor shall supply a layout and BoQ of the proposed pipework to fit the pumps offered. **All suction pipework shall be grade 304L stainless steel Sch 10.** A preliminary layout of the pipework is shown on Draw. J1-183-Lay-P-01

.5) Information Required from the Tenderer

- Manufacturer's literature, illustrations and applicable data for the pump, including total weight of the equipment and the weight of the single largest item.
- Manufacturer's certified curves illustrate pump characteristics of head, discharge, brake horsepower and efficiency. Curves shall be plotted from no flow at shut off head to maximum pump runout head and flow allowed by the manufacturer. Points of operation which cause bearing stress or shaft deflection in excess of the manufacturer's tolerances for continuous operation shall be indicated on the submitted curves.
- Materials used in pump construction, details on all pump accessories, and dimensions of major components.
- A list of manufacturer's recommended spare parts to be supplied with the manufacturer's current price for each item. Include O-rings, seals, etc. on the list.

- List bearings by the bearing manufacturer's name and numbers.
- Pumping equipment requiring special tools for maintenance shall be provided with one set of tools labeled, packed with instruction for use, and housed in a metal toolbox with lock-end hoop for each two units provided.
- The following data shall be provided on the drive motors:
rpm at full load, frequency, voltage, full load current, code and design letter, efficiency, horsepower, number of phases, temperature rise, service factor and bearing life rating.

.6) Operating and Maintenance Instructions

For all pumps furnished under this Section, the Contractor shall submit operation and maintenance manuals. Operating and Maintenance Data to include, at a minimum, the following:

- .6.1)** Equipment function
- .6.2)** Description
- .6.3)** Normal and limiting operating characteristics
- .6.4)** Installation instructions (assembly, alignment and adjustment procedures)
- .6.5)** Operation instructions (normal startup and shutdown procedures.
- .6.6)** Normal operating conditions and emergency situations)
- .6.7)** Lubrication and maintenance instructions.
- .6.8)** Troubleshooting guide.
- .6.9)** Parts list and predicted life of parts subject to wear.
- .6.10)** Drawings – cross sectional view, assembly and wiring diagrams.
- .6.11)** Performance curves.

.7) Start-up Supervision

- A factory representative of the pump manufacturer, who has complete knowledge of proper operation and maintenance, shall be provided for two (2) days to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the permission of the Owner, this work may be conducted in conjunction with the inspection of the installation and test run. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

.8) Product delivery, storage and handling

- All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the units and equipment are ready for operation.
- All equipment and parts must be properly protected against any damage during a prolonged period at the site.
- Finished surfaces of all exposed pump openings shall be protected by wooden planks, strongly built and security bolted thereto.

.10) Warranty

- The contractor shall furnish to the Owner a minimum five year warranty on the proposed pump system.
The warranty shall cover repair or replacement of parts resulting from faulty or improper assembly or erection, or defective workmanship or materials.
The warranty period shall commence on the date of shipment.

.11) Pump Construction

- Consideration shall be given to the intended service, in which occasionally debris will lodge between the pump suction check valve and seat. The result is not only in loss of the suction leg, but also in the siphoning of the liquid from the pump casing to the approximate centerline of the impeller. Such occurrence shall be considered normal with proper installation of an air release line free to atmosphere.

In consideration of such occurrence and of the unattended operation anticipated, each pump shall be designed as to retain adequate liquid in the pump casing to insure unattended automatic re-priming while operating at its rated speed in a completely open system without suction check valves and with a dry suction leg.

Openings and passages of the pump shall be large enough to permit the passage of a sphere 63mm. Pump volute or casing shall contain no openings, such as recirculation ports, of a lesser diameter than sphere sizes specified. Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump shall not be permitted.

.12) Pump Casings

The pump casings shall be constructed of close-grained ductile iron, ASTM-A536 of sufficient thickness to withstand all stresses and strains of service at full operating pressure.

The internal casing shall be a modified concentric volute design to reduce the radial loads below 3.33KN at any point on the pump curve, including shut off.

Suction and discharge connections shall be 125 lb. DIN Standard flat-face flanges positioned as indicated on the drawings.

.13) Cover Plate

Pump must be equipped with a removable ductile iron, ASTM-A536 cover plate of sufficient size to allow complete access to pump interior to permit the clearance of stoppages and to provide ample access for service and repairs without disturbing suction or discharge piping.

Cover plate shall be minimal in weight to insure easy removal and replacement, by a single maintenance person.

Under no circumstances shall the pumps pressure relief valve be installed on the cover plate, these are to be fitted to the side of the pump casing out of harm's way.

.14) Wear Plate and Rotating Assembly

Pump shall be fitted with a ductile iron, ASTM-A536 replaceable wear plate. Replacement of the wear plate, impeller, seal and suction check valve shall be accomplished through the removable cover plate or through specially designed rear pullout. The pump wear plate shall be adjustable from the outside of the pump through the provided adjustment screws to restore impeller vane clearances. Pumps without this feature will not be considered acceptable.

The entire rotating assembly, which includes bearings, shaft, seal and impeller, shall be removable as a unit without disturbing the pump volute or piping.

.15) Suction Check Valve

Pump shall incorporate a one-piece suction check valve with neoprene flap valve assembly that can be removed or installed through the removable cover plate opening, without disturbing the suction piping.

The suction check valve shall be clamped in a ductile iron positive mounting clamp, and be bolted from the exterior of the pump case to retain the rubber check valve. The clamp shall be rigidly held into place inside the pump case in a manner that shall eliminate wear between the check valve and the pump case.

Pumps utilizing a hinge pin without special replaceable wear bushings shall not be acceptable.

The sole function of check valve shall be to eliminate re-priming with each cycle. Pumps requiring separate suction check valves to prime or re-prime will not be acceptable.

Re-prime – The pump must be able to re-prime without the check valve installed.

.16) Impeller

Pump impeller shall be of the two (2) vane semi-open, non-clog type of close-grained ductile iron, ASTM-A536 with integral back vanes, threaded to the pump shaft and secured with a stainless steel impeller washer and bolt.

Impeller shall be mechanically secured to the pump shaft by a steel key or other device approved by the Engineer.

Pump shall be provided with a means for externally adjusting the clearance between the impeller and the wear plate.

.17) Seal

The back plate and stuffing box shall be of close-grained ductile iron, ASTM-A536 and bolted to the casing. The cavity in the cover shall be an open dished design with deflector vanes to positively remove build-up of material / gas / air pockets from the seal faces and spring through a cyclonic action "CYCLO-SEAL" to extend the life of the seal. Shaft sealing shall be by means of a single mechanical John Crane Type 2 shaft seal with tungsten carbide / silicon carbide seating and mating rings, 316 stainless steel constructions. The design shall allow for continuous operation without the need for external flush water or venting. Double seals or cartridge seal with water flush are not acceptable.

Mechanical seal shall be lubricated from an independent oil filled reservoir. A clear sight gauge will be fitted to provide easy monitoring of the seal oil level and condition without removing any screws. A vent system will be in place in case of overfilling or pressure. An atmospheric vent between the mechanical seal chamber and the bearing chamber shall form part of the pump protection.

Each mated seal surface shall be lapped to ensure that the seal faces are in full contact at all times. The seal seat must be self-aligning during periods of shock load that will cause deflection, vibration and axial or radial movement of the pump shaft.

Pumps shall be provided with oil lubricated seals which shall be lubricated with oil contained in a separate oil-filled reservoir.

.18) Shaft Bearing

The shaft bearing shall be of ample size and proper design to withstand all radial and thrust loads incurred during normal pump operation. Bearings shall be oil lubricated, with the bearing pedestal cooled by pumped liquid. The steel alloy pump shaft shall be protected by a steel alloy Brinell 313, shaft sleeve through the mechanical seal cavity. The pump shaft shall be sealed against leakage by a balanced mechanical seal. Both the stationary sealing member and mated rotating member shall be of Silicon Carbide.

.19) Shaft

The shaft shall be constructed of ANSI 1144 stress proof alloy steel. The shaft shall be accurately machined and polished and of sufficient size to transmit full driver output without excessive flexure or stressing. Shaft deflections shall not exceed 0.1524 mm measured at end of shaft when operating at the specified design.

.20) Coupling Guards

Pump coupling shall be enclosed in a guard constructed of any one, or combination of materials consisting of expanded, perforated or solid sheet metal.

.21) Pump and Motor Base

The unit base shall be fabricated of commercial grade steel of adequate thickness to prevent flexing or warping under operating conditions.

All seams shall be made with continuous bead welds.

The unit base shall be flanged and drilled on opposite sides to which mounting studs or bolts may be attached for securing the base to the pad.

Pump motor base should be constructed so as to permit motors to be moved to adjust tension of drive bolts.

☼ Quality management

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the pumps, for approval by the Client's representative on site

☼ Testing

a) Before commissioning

- ☒ Refer to Standard Specification
- ☒ **If requested a pump test at the manufacturer/supplier pump test facility to be witnessed by the Client's Representative on site**
- ☒ Test for correct rotation of motors
- ☒ Test for correct operation of control gear
- ☒ Test for correct alignment of shafts, belts & pulleys
- ☒ Submit all certificates required
- ☒ Submit all operation & maintenance manuals

b) Commissioning

- ☒ If the equipment meets the duty requirements
- ☒ Any other performance tests as specified
- ☒ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☒ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) After commissioning

- ☒ Monitor and record all data & performance for the specified test & trial period

MP5.8 CHLORINATION EQUIPMENT

Cl2.1 General

The method of disinfection shall be with Cl₂ gas dissolved in water and dose into the effluent stream. The Cl₂ shall be mixed with water by means of a vacuum operated system. Cl₂ will be transported and stored in the standard **68 kg** cylinders. The contractor shall pay the deposit for the hiring of the first **six (6)** full bottles on behalf of the client.

Cl₂.2 Equipment description

Cl₂.2.1 The gas feed system is a vacuum operated system designed to feed Cl₂ into a stream of water at a maximum required rate of 1 kg/hour. **NB: Chlorine shall be drawn from two cylinders at a time.** The maximum chlorine withdrawal rate from one cylinder is ± 0.65 kg/hour. The system will only operate at ± 0.5 kg Cl₂/hour or less for a very long time of the treatment plant design life but provision must be made to withdraw from two cylinders at a time. The system comprises four main items interconnected by the injector vacuum pipeline:

Cl₂.2.2 A remote mounted aspirator type injector, used to produce the vacuum required to pull the gas from the cylinder, mix it with water and deliver it to the point of application.

Cl₂.2.3 A vacuum demand valve designed to fit directly to gas cylinder, for full vacuum operation. The valve ensures that gas can only be feed when there is a demand (vacuum).

Cl₂.2.4 A flow meter unit that is mounted directly on the vacuum demand valve. The flow meter (rota meter) is fitted with a calibrated tube for gas measurement, and the gas flow is adjustable by means of a V-notch plug. The metering indication on the flow meter must clearly cater for adjustments in the gas flow rate when gas flow is 0.2 to 0.3 kg/hour. The vacuum demand valve must have a pressure relief valve built in.

Cl₂.2.5 A correctly rated effluent booster pump to suit the ejector supplied for vacuum creation. Some suppliers rate the maximum Cl₂ supply as 5 kg/hour with a 19 mm ejector. The normal supply required at the plant at full capacity is ± 0.2 to 0.3 kg/hour.

The tenderer shall include all pipework, dosing nozzle, fixing brackets and pressure release pipework in the price.

Cl₂.3 Safety Equipment

Allowance is made in the electrical contract for an extraction fan with outside mounted switch at the chlorine room.

The following safety equipment must be supplied:

Cl₂.3.1 Approved chlorine notice wall charts at all entrances to chlorine room.

Cl₂.3.2 First aid cabinet containing Linctus Codeine, Modern plastic eye-wash bottles and document with first aid instruction.

Cl₂.3.3 Full face piece self-contained breathing apparatus.

Cl₂.3.4 A gas leak detector system (ammonia) or approved.

Cl₂.3.5 A tap with extension water pipe for washing down, outside the chlorine building. Water supply from constant water supply source.

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 shall apply unless otherwise indicated in this section. 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 project specification shall take precedence over the standard 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 project 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 Margate WWTW and 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 Municipality WTW - 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 and Margate 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 9.1.1.4 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 9.1.1.5 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 9.1.1.6 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 OHSA.

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 9.1.1.7 SETTING OUT OF WORKS

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

The positions of items of electrical 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 9.1.1.8 INSTALLATION OF EQUIPMENT

The electrical contractor shall be responsible for the installation of all 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 9.1.1.9 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.

PS 9.1.1.10 EXISTING SERVICES

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

PS 9.1.1.11 THE SITE

The site of the works is the existing Margate Waste Water Treatments Works in Margate which is about 20km from the Port Shepstone town center on the KZN south coast.

PS 9.1.1.11.1 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 electrical 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 9.1.1.11.2 Climatic Conditions¹

ITEM	DESCRIPTION
Altitude:	Ca 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 & ANCILLIARY WORK

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

PS 5.2.1.1 WWTW – TT1 INLET WORKS & AERATORS

- Supply and installation of PLC and HMI in existing MCC01 for plant automation
- All cabling and wiring for the PLC and HMI and integration to existing aerator VSDs and DOL starters
- New ultrasonic level transmitters in the existing TT1 aerator basin
- New ultrasonic levels sensors in the existing TT1 inlet channel
- New flow meters for flow measurement into the TT1 inlet works
- Power supply 24V DC for new level sensor in existing inlet channel and aerator basin
- Intrument cabling for the flow meters and level transmitters
- Integration of the level sensors, flow meters etc to the new PLC and HMI

- New lighting in inlet works structure
- MCC for mechanical screens, compactor, washer etc (future)
- 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 – TT1 RECYCLE SLUDGE PUMPS AND SEDIMENTATION TANKS 1 & 2

- Supply and installation of PLC and HMI in existing MCC02 for plant automation
- All cabling and wiring for the PLC and HMI and integration to existing aerator VSDs and DOL starters
- New ultrasonic level transmitters in the existing recycle pumps sump
- New flow meter for flow measurement from the recycle pumps
- Power supply 24V DC for new level sensor in existing sump
- Instrument cabling for the flow meters and level transmitters
- Integration of the level sensors, flow meters etc to the new PLC and HMI
- New lighting in inlet works structure
- Lightning protection and earthing for the existing Recycle Pump Station
- 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 9.2.1.3 WWTW - TT2 SLUDGE PUMPS AND SEDIMENTATION TANKS 3 - 4

- Supply and installation of PLC and HMI in existing MCC02 for plant automation
- All cabling and wiring for the PLC and HMI and integration to existing aerator VSDs and DOL starters
- New ultrasonic level transmitters in the existing recycle pumps sump
- New flow meter for flow measurement from the recycle pumps
- Power supply 24V DC for new level sensor in existing sump
- Instrument cabling for the flow meters and level transmitters
- Integration of the level sensors, flow meters etc to the new PLC and HMI
- New lighting in inlet works structure
- Lightning protection and earthing for the existing Recycle Pump Station
- 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 9.2.1.4 WWTW - TT3 INLET WORKS

- Supply and installation of a new MCC11 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 9.2.1.5 WTW – CHLORINE/CHEMICAL DOSING BUILDING

- Disconnect and relocate the existing MCCs in the existing chlorine and chemical dosing building to a higher level in the building
- Allow an amount for modifications to control systems
- The supply and installation of a new PLC and HMI in the existing MCC for plant automation for the dosing pumps and ancillary equipment.
- The lightning protection and earthing for the existing chlorine and chemical dosing building
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.6 TT3 – EXISTING INLET WORKS & NEW MECHANICAL SCREENS etc

- Disconnect and remove the existing DB at the inlet works

- Disconnect and remove the existing electrics, lights , power points, cabling and lighting , level sensors etc for the existing inlet works
- Supply and install new MCC11 for the inlet works for the mechanical screens, compactor etc
- The emergency stop locks adjacent each new mechanical screen etc
- The cabling to the new mechanical screens etc
- The supply and installation of a new DB in the new MCC building for lighting and power etc
- The supply and installation of a new PLC & HMI for the new MCC for plant automation
- 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 screens, pumps and instruments etc
- The lightning protection and earthing for the new inlet works and MCC building
- New level transmitters in the inlet works channel for automation of plant and associated equipment
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.7 TT3 – AIR BLOWERS FOR FINE BUBBLE AERATION

- Disconnect and remove the existing MCCs for the existing air blowers
- Disconenct and remove the cabling etc for the existing air blowers and asociated equipment, instruments , sensors, air flow meter etc
- Disconnect and remove the existing electrics, lights , power points etc in the blower room
- Supply and install new MCC05 for the new blowers
- Supply and install stop locks adjacent all blowers
- Supply and install local control panel for the sedimentation bridge motors
- New power cabling from the existing Main LV Panel to the new MCC
- Supply and instal new cables to the air blowers, motor heaters & thermisters and stop locks
- Supply and installation of new cables to all air flow meters, 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 Air Blower Room
- New lights and power points for the Air Blower Room Building and associated areas
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.8 TT3 – NEW SLUDGE RE-CIRCULATION PUMPS & RAS PUMP STATION

- Supply and install new MCC08 for the new sludge re-circulation pumps, RAS pumps and snw sedimentation tank rotating bridge motors
- Supply and install stop locks adjacent all new pumps
- New power cabling from the exiting Main Panel to the new MCC08
- Supply and instal new cables to the new re-circulation pumps and RAS pumps, and sedimentation tank rotating bridges motors, 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 New Sludge Pump Room Building
- New lights and power points for the New Sludge Room Building and associated areas
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems

PS 9.2.1.9 WWTW - MAIN SUBSTATION / LV PANEL (SITE POWER)

- Disconnect and remove the existing Eskom meter panel
- Relocate the Eskom meter panel to a new meter room (to be constructed under civil works)
- New cabling for the reloated meter panel
- Supply and installation of all cable support ladders and trays
- Trenching and backfilling for cables
- Lightning protection and earthing for the Main Switch and Transformer Building including New Meter Room

- New lights and power points for the Main Switch and Transformer Building including New Meter Room
- Integration of the MCC and the electrical system to the PLC, local and remote SCADA and telemetry systems
- New canopy type stand-by generator for the entire site

PS 9.2.1.10 WWTW – SITE AND GENERAL

- Supply and installation of new power cabling from the Ex PaIN Panel to the New MCCs as follows :
 - Blower Room MCC
 - TT3 Inlet Works MCC
 - TT2 New Re-Circulation Pumps / Sedimentation Tanks MCC
 All trenching and backfilling for power and instrumentation cabling
- All site wide cable sleeves and manholes (manholed by civil contractor)
- New 10KWp solar power system for the WWTW site for lighting only
- 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 9.2.1.11 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 In the aeration basins (level measurement)
- Level control electrodes and float switches
- Dissolved oxygen (DO) sensors in the aeration basins for automatic control and monitoring of the aerators
- New SCADA 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 Room to receive signals and communications from the WWTW
- New telemetry systems between the WWTW and UGU Control Room
- Air pressure sensors on the blower air pipeline
- Flow meter on the blower air pipeline

PS 9.2.1.12 PUMP STATIONS – MARGATE PUMP STATION 4A

- Disconnect and remove the existing starters in the existing MCC for the existing pumps (3 x 75 kW pumps immersible type)
- Install new 75kW VSDs in the existing MCC for the existing pumps (to eliminate frequent stopping and starting of the pumps)
- Control wiring modifications for the new VSDs
- New PLC and MCC for plant automation and for communication between the pump station and the SCADA at the WWTW
- New telemetry system and integrate to SCADA system at UGU Control Room
- Remove existing 500kVA stand-by diesel generator (situated in a room on the river flood line)
- Supply and install new 250KVA canopy type generator on a plinth adjacent the pump station

PS 9.2.1.13 STAND-BY GENERATORS

- New stand-by generator for the Margate WWTW site
- Dis-connect and remove the existing 500KAV generator for the Margate sewer pump station 4A
- New stand-by generator for the Margate Sewer Pump Station 4A on a new plinth
- Connection of the generators to the relevant MCCs
- Testing and commissioning of the new generators

Refer to clause PS 9.7 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 9.2.1.14 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 5.2.2 MECHANICAL

The Mechanical Systems comprise of the following:

- a) Extract fans for the pump stations and other MCC buildings
- b) Split type air-conditioning units for the existing Admin and Control Building.
- c) Portable handheld fire extinguishers in all areas
- d) Fire signage in all areas
- e) Pumps, motors and other mechanical equipment are covered elsewhere in the tender
- f) Process and treatment plant equipment are covered elsewhere in the tender

PS 9.2.3 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) The intercom/security, fire detection wiring, equipment and connections.
- d) The Eskom incoming main supply covered by the supply authorities responsibilities to a defined consumer responsibility point.
- e) Any item of a building or structural component including louvres , grilles etc
- f) Builders work , openings in brickwork , floors , slabs etc.
- g) Manholes
- h) Mechanical and process equipment, pumps and motors etc (by mechanical contractor)

PS 5.3 DRAWINGS

The following electrical and instrumentation drawings are issued and shall form part of the tender documents and should be read with the specifications at all times.

MAR002-E-001 - Site Plan Electrical Distribution and Reticulation Layout

MAR002-E-002 - Existing Electrical Distribution and Reticulation Layout – Single Line Diagram

MAR002-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 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.

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 contractor 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 station 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 kiosk/meter forms the upstream battery limit for the site electrical works.

The contractor shall co-ordinate all necessary with Eskom 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.

Meters

The main electricity consumption meter shall be supplied and installed by others or are existing.

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 9.5.3 NEW MCC05 (TT3 BLOWER BUILDING)

The blowers and associated 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 Blower Room .The final position shall be determined later depending if it can fit in the positions shown.

The MCC 06 shall be equipped with all the necessary feeders or starters for the various blowers and associated equipment etc and for the various instruments. The MCC 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 500 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 MAR002-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 reset 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. (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 : VSD Starter for 30kW 400V Blower 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. VSD 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

This panel shall be labelled "Blower 1 "

Panel 3: VSD Starter for 30kW 400V Blower 2

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. VSD 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 " Blower 2 "

Panel 4 : VSD Starter for 30kW 400V Blower 3

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. VSD 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 " Blower 3 "

Panel 5 : VSD Starter for 30kW 400V Blower 4

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. VSD 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 " Blower 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 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 7: 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 8: Spare Panel

1 No. Suitably rated DP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.

Panel 9 : Marshalling

Terminals, bases, relays etc. as required

Panel 10 : 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
 1 x 5 Amp SP CB (by-pass switch)
 2 x 20 Amp SP CB's (plugs and other)
 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
 2 x 5Amp 24V DC Power supply and busbars – feed to air flow meter, DO sensors etc
 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 and incorporated with 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 PLC shall be supplied from the UPS. Provision shall be made for a battery and battery charger for the PLC.

The PLC cabinet shall comprise the following as a minimum :

- Circuit breakers
- Battery charger
- Battery
- PLC with rack if required
- PLC 24V DC power supply
- PLC & controller
- 15" HMI
- 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

No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All blower status - run, stop , trip, e-stop, air flows 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 blowers, pumps and other mechanical equipment 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 blower system shall be automatically controlled by the level transmitters and DO sensor/s (dissolved oxygen sensors) in the aeration basin for TT3. The final control system shall be developed with the appointed contractor and panel builder. This must be priced for in the tender.

PS 9.5.4 MCC11 : TT3 INLET WORKS (MECHANICAL SCREENS etc)

The mechanical screening 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 reset 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: VSD Forward – Reverse Starter 2,2kW 400V 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 contactor before the starter
- 1 No Elsec or similar earth leakage unit for outdoor motor protection
- 1 No. VSD Forward-Reverse Starter for 2,2kW 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

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- 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 " Screen 1 "

Panel 3: DOL Starter for 3kW 400V 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 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 " Conveyor 1 "

Panel 4: DOL Starter for 3kW 400V Compactor 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 "Compactor 1 "

Panel 5: VSD Starter 2,2kW 400V Wash Water Booster 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 contactor before the starter

-
- 1 No Elsec or similar earth leakage unit for outdoor motor protection
 - 1 No. VSD Forward-Reverse Starter for 2,2kW 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 “ Wash Water Pump 1 “

Panel 6 : Spare Panel

- 1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.

Panel 7 : 24 V DC POWER SUPPLY

- 1x 30 Amp TP main switch and busbars
- 2 x 10Amp SP Circuit breakers
- 2 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 8 : 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 9 : PLC & HMI

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 existing Main HMI in MCC01. The main HMI is to be programmed with all the mechanical inlet works screens etc status from MCC05.

The PLC cabinet shall comprise the following as a minimum :

- Circuit breakers
- Battery charger
- Battery
- PLC with rack if required
- PLC 24V DC power supply
- PLC & controller
- 15" HMI
- 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

No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

I/O,s shall include but not limited to the following :

Power - on , off

Auto or manual mode

All screens etc 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 screens, conveyor, compactor, wash water pumps etc and other mechanical equipment 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 screening system shall be automatically controlled by the level sensors situated in the inlet channel 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 9.5 5 MCC10 : NEW SLUDGE, RE-CIRCULATION PUMPS & SEDIMENTATION TANKS 5 - 6

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 new 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 reset 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 Recirculation 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 Recirculation Pump 1 “

Panel 5 : Stand-By VSD Starter for 7,5W Sludge Recirculation Pump 2

This panel shall be similar to Panel No 2 for Sludge Recirculation Pump 1

This panel shall be labelled “Sludge Recirculation 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 & HMI

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.

The PLC cabinet shall comprise the following as a minimum :

- Circuit breakers
- Battery charger
- Battery
- PLC with rack if required
- PLC 24V DC power supply
- PLC & controller
- 15" HMI
- 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

No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

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 9.5.8 MCC08 : SLUDGE DEWATERING PLANT & EQUIPMENT

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
- 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 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
- 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: 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
- 15" HMI
- 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

No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

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 to be used for automatic 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 9.5.13 MCC09 – MARGATE SEWER PUMP STATION 4A (FUTURE)

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 reset 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.

The PLC cabinet shall comprise the following as a minimum :

- Circuit breakers
- Battery charger
- Battery
- PLC with rack if required
- PLC 24V DC power supply
- PLC & controller
- 15" HMI
- 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

No Fibre Optic interface switch

1 No 8 port ethernet switch with fibre optic interface

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 9.5.14 DISTRIBUTION BOARDS & FAN CONTROL PANELS AND OTHER CONTROL PANELS

PS 9.5.14.1 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 9.5.15 LOCAL CONTROL PANELS

PS 9.5.15.1 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 9.5.15.2 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 9.5.15.3 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 9.5.15.4 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 backwash pumps shall be fed from their respective MCC05, MCC08, MCC10, MCC11 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 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 as 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 weatherproof 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					
E01	Ex Eskom Trans-former / meter	Generator Control Panel	3x240mm ² x 4 Core ECC	Cable duct & ground	
E02	Generator Control Panel	Main LV Panel	3x240mm ² x 4 Core ECC	Cable duct & ground	
E03	Main LV Panel	Blower MCC05	120mm ² x 4 Core ECC	Sleeves & ground	
E04	Main LV Panel	TT3 Inlet Works MCC06	25mm ² x 4 Core ECC	Sleeves & ground	
E05	Main LV Panel	Sludge & Re-circulation Pumps MCC	35mm ² x 4 Core ECC	Sleeves & ground	
E06	MCC05	Blowers 1 - 4	35mm ² x 3 Core ECC	Sleeves & ground	
E07	Inlet Works MCC06	Mechanical screens, conveyors etc	6mm ² x 3 Core ECC	Sleeves & ground	
E08	Inlet Works MCC	Sludge Pumps	16mm ² x 3 Core ECC	Sleeves & ground	
E09	Main LV Panel	Ex Admin/Offices	16mm ² x 4 Core ECC	Sleeves & ground	
E10	Main LV Panel	MCC07 Chlorine/Chemical Dosing	16mm ² x 4C ECC	Ground & sleeves	
E11	MCC07	Workshop DB	16mm ² x 4C ECC	Ground & sleeves	
E12	Main LV Panel	Dewatering Plant MCC08	16mm ² x 4C ECC	Ground & sleeves	
E13	MCC (all)	All motor stop locks	1.5mm ² x 3C ECC	Cable tray	

Cable Ref	Cable Destination		Cable Type Size and No.	Installation Method	Length m (1)
	From	To			
E14	MCC (all)	All motor heaters	1.5mm ² x 3C ECC	Cable tray	
E15	MCC (all)	All motor thermistors	2.5mm ² x 3C ECC	On cable tray	
E16	MCC (all)	All motors up to 15kW	10mm ² x 3C ECC	On cable tray	
E17	MCC (all)	All motors up to 7,5kW	10mm ² x 3C ECC	On cable tray	
E18	MCC (all)	All motors up to 5,5kW & Inlet Works Screens etc	2.5mm ² x 3C ECC	On cable tray and ground	
E19	MCC 07	All Chemical and Chlorine Dosing Pumps & Equipment (Future)	2.5mm ² x 3C ECC	On cable tray	
E20	MCC (All)	Level electrodes and floats	2.5mm ² x 4C ECC	On cable tray	
E21	MCC (All)	Instruments/sensors/flow meters/flow switches etc	1,5 & 2,5mm ² x 4C ECC	On cable tray	
SL01	MCC (All)	Streetlights or floodlights or pole lights	4mm ² x 4C ECC	In ground and sleeves	
PUMP STATION 4A:					
E22	Eskom meter panel (Sub)	Generator Panel Pump Station 4A	2x150mm ² x 4C ECC	Ground & sleeves	
E22	Generator Panel 4A	MCC09 Pump Station 4A	2x150mm ² x 4C ECC	Ground & sleeves	
E24	MCC09	75W submersible pumps 1 – 3 (VSD)	95mm ² x 3C ECC	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
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
CC06	PLC (all)	SCADA (patch panel)	8 pair single mode fibre optic	Ground & sleeves	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 9.6.1.4 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 9.6.1.5 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 9.6.1.6 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 9.6.1.7 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 9.6.1.8 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 9.6.1.9 Manholes

Where required, 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 9.6.1.10 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 9.7 STAND-BY GENERATORS

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 or plinth is to be constructed as the existing one is not easily accessible for maintenance and filling of fuel. The existing generator is to be disconnected and removed. A new set is thereafter required for this pump station, reconnected and commissioned.

A new generator is required for the Margate WWTW.

PS 9.7.1 Scope of Work

The scope of work shall comprise the following :

- The supply and installation of one new canopy type generator with control panel installed in the existing Margate WWTW site rated at 650kVA
- Disconnect and remove the existing 500Kva open type generator for the existing Margate Pump Station 4A
- The supply and installation of one new canopy type generator with control panel installed in the existing Margate Pump Station 4A rated at 650Kva
- Supply and installation of new LV cabling from the Eskom sub-station to the new generators for Margate WWTW
- Supply and installation of new LV cabling from the Eskom sub-station to the new generators for Margate WWTW to the existing Main LV Panel at the WWTW
- Supply and installation of new LV cabling from the Eskom sub-station to the new generators for Pump Stations 4A and to the new MCCs in the existing sewer pump stations
- Trenching and backfilling of cable trenches
- All cable sleeves and ancilliary work.
- Synchronization of the new and existing repaired generator sets and the existing mains supply by Specialist
- Re-programming of the 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
- 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 9.7.3 STAND-BY GENERATOR SPECIFICATIONS

The new generators for the Margate WWTW and for the Margate Sewer Pumps Station 4A 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 9.7.3.1 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 9.7.3.2 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 9.7.3.3 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 9.7.3.4 Test Certificates and Inspections

The following tests are to be carried out:

- (a) At the supplier's premises, before the generating set will be delivered to site the Engineer/Consultant shall be present during the test to satisfy them that the generating set complies with the specification and delivers the specified output. The test must be carried out in accordance with BSS 5514, Part 2 and 3. The Engineer/Consultant must be timeously advised of the date for the test.
- (b) After completion of the works and before first delivery is taken, a full test shall be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation shall be inspected, and the contractor shall make good, to the satisfaction of the Engineer/Consultant, any defects which may arise.
- (c) The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.
- (d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Engineer/Consultant.

PS 9.7.3.5 Guarantee and Maintenance

The Contractor shall provide a warrantee for the complete plant for a period of **twelve months** after final completion. The plant shall be serviced and maintained free of charge during the 12 months defects liability period.

If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, immediate steps shall be taken to rectify the defects and/or replace the affected parts on site at his own expense.

Should the Contractor fail to hand over the plant in good working order on the expiry of the specified twelfth month warrantee period, the Contractor shall be responsible for further monthly maintenance until final delivery is taken.

During this period the contractor will undertake to arrange that the plant be inspected at least once per month by a qualified member of his staff who shall:

A checklist shall be provided with the following items:

- (a) Report to the Engineer/Consultant, keeping the maintenance records, and enter into a logbook the date of the visit, the tests carried out, the adjustments made, and any further details that may be required.
- (b) Grease and oil moving parts, where necessary.
- (c) Check the air filter and, when necessary, clean the filter and replace the filter and oil.
- (d) Check the lubricating oil and top-up when necessary.
- (e) After the plant has run, one oil change for the number of hours stipulated by the manufacturers, drain the sump and refill with fresh lubricating oil. The reading of the hour meter on the switchboard shall be taken to establish the number of hours run by the plant.
Under this heading only the cost of the actual oil used, shall be charged as an extra on the monthly account.
- (f) Clean the lubricating oil filter and/or replace the filter element at intervals recommended by the engine manufacturer, the cost of a new filter element to be charged as an extra on the monthly account.
- (g) Check and when necessary adjust the valve settings and the fuel injection Equipment.
- (h) Check the battery and top-up the electrolyte when necessary.
- (i) Test-run the plant for 0,5 hour and check the automatic starting with simulated Faults on the mains, the proper working of all parts, including the electrical switchgear, the protective devices with fault indicators, the changeover equipment and the battery charger. Make any necessary adjustments necessary.
- (j) Report to the Engineer/Consultant any parts that become unserviceable through fair wear and tear, or damaged by causes beyond the control of the Contractor.
- (k) Advise the Engineer/Consultant when it has becomes necessary to de-carbonize the engine and submit a quotation for this service.
- (l) Top up the water of the radiator, if applicable.
- (m) Clean the plant and its components.

PS 9.7.3.6 Material and Workmanship

- (a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Engineer/Consultant who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and material, which, in his judgement are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.
- (b) All work shall be executed in a first-class manner by a qualified tradesman.
- (c) The Contractor shall warrant that the materials and workmanship shall be of the highest quality and standard, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and the Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. The Contractor shall also be prepared to promptly furnish any installation relating to his own work as may be necessary for the proper installation work and shall co operate with and co- ordinate the work with others as may be applicable
- (d) All components and their respective adjustment, which do not form part of the equipment installation work but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contract's scope of works.
- (e) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.
- (f) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation and guarantee periods to ensure the safety of the User Client.

PS 9.7.3.7 Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents.

PS 9.7.3.8 Submittals

The following information must accompany the tender documents

- (a) Full particulars, performance curves and illustrations of the equipment offered, must be submitted with the Tender.
- (b) The design of the control system to comply with the requirements for automatic starting, stopping, interlocking and isolation as specified.
- (c) Curves furnished by the engine makers, showing the output of the engine offered against the speed, for both intermittent and continuous operation as well as fuel consumption curves when the engine is used for electric generation. The successful Tenderer must, as soon as possible after receipt of the order, submit detailed plant and mechanical drawings and wiring diagrams of the plant and the switchgear and control gear. One diagram shall be contained in a metal pouch on the side of the switchboard.
- (d) All civil and building requirements for the generators, container and step-up transformer

SECTION 2 – EQUIPMENT REQUIREMENTS

PS 9.7.3.9 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 9.7.3.9.1 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 9.7.3.9.2 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 9.7.3.9.3 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 9.7.3.9.4 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 9.7.3.9.5 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 9.7.3.9.6 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 9.7.3.9.7 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 9.7.3.9.8 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 9.7.3.9.9 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 9.7.3.9.10 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 9.7.3.9.10 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 9.7.3.9.11 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 9.7.3.9.12 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 9.7.3.9.13 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 9.7.3.10 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 9.7.3.10.1 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 9.7.3.10 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 9.7.3.10.3 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 9.7.3.10.4 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 9.7.3.10.5 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 9.7.3.11 Switchboard

PS 9.7.3.11.1 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 9.7.3.11.2 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 9.7.3 11.3 Protection and Alarm Devices

All switchboards and control panles 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 9.7.3 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 9.7.3.11 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 9.7.3.11.6 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 9.7.3.12. 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 9.7.3.13 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.

(a) Unauthorised work on equipment prohibited.

(b) Unauthorised handling of equipment prohibited.

(c) 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 9.7.3.14 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 9.7.3.15 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 9.7.3.16 SECTION 3 – TECHNICAL SPECIFICATION

PS 9.7.3.16.1 General

Supply, deliver, install, test, commission and maintain an emergency generating set at Margate WWTW and Pump Station 4A.

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 9.7.3.16.2 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.

- | | | |
|----|-----------------------------|--------------------------------------|
| a) | Height above sea level | : 59 meter above sea level @ Margate |
| b) | Maximum ambient temperature | : 45°C |

PS 9.7.3.16.3 Output and Voltage

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 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 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

The loads for the WWTW is to be confirmed.

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 9.7.3.17 Switchboard/Control Panel Unit**PS 9.7.3.17.1 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 9.7.3.17.2 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 9.7.3.17.3 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 9.7.3.18 Regulations and Other Requirements

The installation shall be erected and tested in accordance with the following acts and regulations:

- a) The latest issue of SABS 0142: "Code of practice for the wiring of premises."
- b) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended.
- c) The local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the Municipal By-laws and any special requirements of the local supply authority.
- d) The Fire Brigade Services Act 1993 Act 99 of 1987 as amended.
- e) The National Building Regulations and Buildings Standards Act 1977 (Act 103 of 1977) as amended
- f) The Post Office Act 1958 (Act 44 of 1958) as amended.
- g) The Electricity Act 1984 (Act 41 of 1984) as amended.

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.

A 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 9.8 LIGHTING AND SMALL POWER SYSTEMS

The scope is the supply, installation and connection of all lighting distribution cable and wireways, conduit, cabling and conductors and all associated circuit equipment, light switches, isolators, socket outlets etc. complete. The supply, installation and connection of all luminaires is also in the scope of works.

Buildings, pump station and other structures :

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. Where no drawings exists or provided, the Engineer will direct the installation on site or issue an instruction to the requirements.

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

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 downlights 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 MAR002-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 weatherproof 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 9.9 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 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 built 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 9.10 INSTRUMENTATION, SCADA & PLC SYSTEM

PS 9.10.1 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 9.10.2 SCADA

The Water Treatment Works Control Room at the Margate WWTW 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 proposed is for all existing equipment systems and 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 and for the WWTW. 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, Server, 1 No 55" 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)
- MCC10 - TT3 Inlet Works Screens / Conveyor etc
- MCC05 - TT3 New Blowers
- MCC06 - TT3 New Re-circulation Pumps and Sedimentation Tanks 5-6

Other PLCs will be installed under future phases of the project.

PLCs for the existing remote sewer pump stations 1, 1A , and 3A are to be installed in their respective MCCs in the future and will not be part of this project. Other PLCs will be installed under future phases of the project.

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 9.10.3 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 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)
- MCC10 - TT3 Inlet Works Screens / Conveyor etc
- MCC05 - TT3 New Blowers
- MCC06 - TT3 New Re-circulation Pumps and Sedimentation Tanks 5-6

The HMI is only required in MCC01 which will act as the main MASTER PLC.

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 Schneider type 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 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 Schneider 15" HMI's compatible with the above PLC's 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.

GENERAL:

The SCADA AND PLC system shall include for all hardware, software engineering system design, programming, layout, process block and network control diagrams, screen pages and wiring drawings etc complete in all respects. Full details of the system shall be provided with the tender offer. All other diagrams, drawings and layouts as specified shall be provided. The

programming shall be undertaken by a specialist system integrator who is qualified and experienced with the hardware and software for the Schneider equipment supplied.

PS 9.10.4 TELEMETRY

The various remote pump stations 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:

- a) Analogue inputs expandable to a minimum of thirty-two inputs
- b) Digital inputs expandable to a minimum of ninety-six inputs
- c) 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
- 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 9.10.5 PARTICULAR SPECIFICATION FOR ULTRASONIC LEVEL TRANSMITTERS & INSTRUMENTS

The following level transmitters and their positions are required on this project:

Instru- ment Ref No	Item	Sensor Lo- cation	De- scrip- tion/Pri nciple	Quan- tity	Pipe di- ameter (mm)	Function	Transmitter Location	PLC/ SCA DA	Draw- ing No.
IN-A14- LV-003	Level Sensor 1	Aerator Ba- sin TT1	Ultra- sonic %/m	1	n/a	Level monitoring, low level dosing pump trip	MCC-01	Y	N/A
IN-A14- LV-004	Level Sensor 24	Aerator Ba- sin TT2	Ultra- sonic %/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 9.10.6 PEPPER SPRAY & CCTV CAMERA SYSTEM

PS 9.10.6.1 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 Pump Station 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 9.10.6.2 CCTV CAMERA SYSTEM

In addition to the above pepper spray system, CCTV camera systems are to be installed for the following buildings and pump stations at the WWTW as follows :

- New Blower Room
- TT3 Inlet Works MCC Room

The following pump station shall also be equipped with a pepper spray system

- 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 stations or MCC buildings 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 9.10.7 DISSOLVED OXYGEN (DO) SENSORS AND CONTROLLER

Dissolved oxygen sensors shall be Hach LDO type or similar and equal approved for automatic control of the aerators.

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: Backlighted 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 9.10.8 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
FM-005	Flow Meter – 5 TT1 Inlet Works	MCC	Electronic/flow	1	Open Channel	Remote flow monitoring from SCADA + local	Y
FM-006	Flow Meter – 6 TT2 Inlet Works	MCC	Electronic/flow	1	Open Channel	Remote flow monitoring from SCADA + local	Y
FM-007	Flow Meter – 7 TT3 Inlet Works	MCC	Electronic/flow	1	Open Channel	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 9.10.8.1 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 ($> 1 \mu\text{S/cm}$ for liquids other than water; $> 20 \mu\text{S/cm}$ 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: $-40\dots+180^{\circ}\text{C}$ | $+40\dots+356^{\circ}\text{F}$
- 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: $\pm 0.2\%$ of measured value $\pm 1 \text{ mm/s}$
- 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 9.10.8.2 Electromagnetic ultrasonic open channel flowmeter

Open channel flowmeter shall be on the venturi type for measurement of raw sewage in open channels and be of the Krohne or similar approved type.

Full technical details and literature of the open channel flow meter shall be returned with the tender.

PS 9.10.8.3 Air Flow Meter

An air flow meter is required to be installed on the new DN 350 air delivery pipe from the air blowers to the air discharge nozzles to the fine bubble aeration basin.

The flow meter can be an in-line type or as recommended by the supplier to meet industry standards.

Full technical details and literature of the air flow meter shall be returned with the tender

PS 9.10.11 UPS & UPS DB

PS 9.10.11.1 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 MCCs, or Control Room of the Admin Building adjacent the SCADA/PLC cabinet . 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 Umgeni Water standard specifications included elsewhere in this document.

Full technical details and literature of the UPS proposed shall be supplied with the tender. Failure to do so may disqualify the tender. The UPS shall comply with the requirements of the Client's standards specifications.

PS 9.10.11.2 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
- 6 x 20 Amp SP circuit breakers
- Terminal blocks as required

PS 9.10.12 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 WIKA S-10, 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 contractor is to obtain prior approval if

he intends using a transducer from another supplier.

b) Pump Casing Temperature Transducer (Supplied with Pump)

WEG, ABB, Tempcon, IMF or other approved motor thermistors 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

Electronic flow switches are required for the no flow sensing and pump shutdown and shall be installed on the suction or delivery side of the pumps in positions shown on the drawings. The sensors shall be installed in ½ inch BSP sockets welded to the pumps suction or delivery 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 to100deg: medium pressure 50bar. 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 dirty raw water, sewer water or de-sludge water pumping systems.

d) Low Level Cut-Out Switch

Low level float switches or electrodes for pump dry run protection shall be as supplied by AC/DC or other approved manufacturer 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.

e) 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 9.11 MECHANICAL

PS 9.11.1 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:

- a) Extract fans wall or cladding mounted in existing pump stations or chemical dosing building
- b) 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 9.11.2 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 9.11.3 VENTILATION SYSTEM

The pump stations, chemical dosing or other process rooms shall be equipped with ventilation extraction systems as shown on drawing numbers (still to be produced) and as quantified in the bill of quantities and as identified on site.

Ventilation of toilets:

Wall mounted Luft or similar and equal approved wall extract fans shall be installed extracting the air from these areas to the outside air. These fans shall be switched via the light switch or by starter contactors and push buttons in the MCC or DB. The fans shall be as specified in the bill of quantities.

Electrical isolators shall be provided adjacent the fan units.

Openings for fans in brickwork and roof or side sheeting shall be provided by the civil contractor including any weather louvres etc. Mounding frames and flashing for fans in roof sheeting or side cladding shall be provided by the contractor.

PS 9.11.4 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, dosing rooms or pump stations.
- All associated statutory signage to SANS10400 standards and regulations for the above hose reels and extinguishers. Signage shall be rivetted or screwed to walls or doors.

All fire water pipes 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 9.12 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.

A label no smaller than 80mm high shall be mounted adjacent to each pump to identify it as a "PUMP 1 or "PUMP 2".

PS 9.13 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 17,5kW shall be fitted with thermistors, one per phase.

Where required or specified, motors shall be fitted with DE & NDE bearing vibration and temperature sensors. These requirements will be specified under the pumping or mechanical plant specifications.

Submersible and immersible pumps are to be supplied with thermistors and moisture sensors built into the pump.

PS 9.14 MAIN SWITCHBOARD AND MOTOR CONTROL CENTRE

PS 9.14.1 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 9.14.2 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 9.14.2 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 9.14.3 Setting out of Switchboard

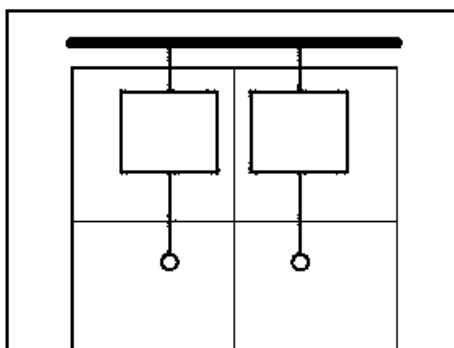
The Assemblies to be provided against this specification shall be metal-clad, fully enclosed low voltage switchgear as required for application as a Motor Control Centre and Distribution Switchboard.

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 9.14.4 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 9.14.5 Busbar rating

The assembly main busbar shall be rated across its full length for the incomer current carrying capacity.

PS 9.14.6 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 9.14.7 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 9.14.8 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 9.14.9 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 aluminium) sized to accept the planned cable types and number complete with cable glands.

PS 9.14.10 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 9.14.11 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 9.15 INSTALLATION OF DISTRIBUTION BOARDS**PS 9.15.1 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 9.15.2 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 9.15.3 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 - 16mm² 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 9.15.4 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 9.15.5 CABLE AND WIREWAYS

PS 9.15.5.1 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 9.15.5.2 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 9.15.5.3 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 9.15.6 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 9.15.6.1 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 9.15.6.2 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 9.15.6.3 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 9.15.6.4 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 9.15.6.5 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 9.15.6.6 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 9.15.6.7 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 9.15.6.8 Power points**PS 9.15.6.8.1 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 ± 1500 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 9.15.6.8.1 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 9.15.7 LUMINAIRES**PS 9.15.7.1 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 9.15.7.2 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 9.15.7.3 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 brandering to allow fixing of the surface mounted luminaires and provide holes for the down-lighters.

PS 9.15.7.4 Fixing of luminaires

Luminaires shall be installed in the position(s) indicated on the drawings. The Engineer shall determine final positions.

PS 9.15.7.5 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 9.15.7.5 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 9.15.7.6 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 9.15.7.7 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 9.16 TESTING

PS 9.16.1 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 9.16.2 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 9.16.3 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 9.16.4 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 9.16.5 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. Certifications as required herein.
Additional information as required in the specifications.

PS 9.16.6 Conductor Tests (600 Volts or Less)

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.

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.

Test shall be made using a Megger or equivalent at a voltage of not less than 1000 VDC, 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

Conductors which do not meet or exceed the following insulation resistance values shall be removed, replaced, and retested. Conductor test results shall indicate weather conditions, temperature, relative humidity, date and time, feeder tested,

conductor size and type and resistance measurements..

PS 9.16.7 Service Switchboard Earth Resistance Test

- b) 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.

The test shall be performed using a Megger Earth Tester or equivalent test instrument and shall not be performed immediately following wet weather conditions.

Switchboard earth resistance test results shall indicate weather conditions for test, earthing system tested, earthing configuration and test results.

PS 9.16.8 Earth Fault Protection System Tests

PS 9.16.9 Factory test

- c) The switchboard ground fault protection system shall be factory tested prior to shipment.

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.

Certified "factory test" results shall indicate relay number, device served, actual characteristic curves, design characteristic curves and overall test results.

PS 9.16.10 Field test

- d) 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.

Certified "field test" results shall indicate relay tested, relay settings, and test results.

PS 9.16.11 Special Testing

Certify in writing that the system operation is in accordance with specifications and code requirements.

PS 9.16.12 Balancing of Electrical Circuits

- e) 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.

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.

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 9.16.13 Operational Testing

- f) 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.

Controls for lighting and receptacle circuits shall be demonstrated.

Demonstrate running of motors with controls and interlocks.

Demonstrate operation of electrical equipment appliances.

PS 9.16.14 Cables

- g) 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.
 LV cables shall be tested by means of a suitable megger at 1kV and the insulation resistance shall be tabulated and certified.
 MV cables shall be pressure tested in accordance with the manufacturer's recommendations and exact leakage current shall be tabulated and certified.
 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.
 The contractor shall notify the Engineer and if applicable the Supply Authority timeously so that their representative may witness the tests.
 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.
 The contractor shall provide all the testing equipment as required for the respective tests.

PS 9.16.15 Density of Bedding and Back Fill Material

- h) 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.
 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 9.16.16 Electrical Tests

- i) 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 9.16.17 PLC Process Flow , PLC Tests and Instrument Tests**PS 9.16.17.1 Project Flow (PF)**

- Propose control philosophy (consult with Client and Engineer)
- Review above philosophy
- Raise queries with Client or Engineer
- Receive final control philosophy from EWS (Signed)
- PLC Quality Control and FDS, Processes and Procedures
- Program PLC
- Create HMI Screens
- Send HMI screens for approval
- Review and finalise screens with EWS
- Factory acceptance test
- Site acceptance test

PS 9.16.17.2 Factory Acceptance Test (FAT)

- Visual inspection to confirm that the drawing matches the physical panel.
- Input & output testing (Confirm correct wiring to and from PLC)
- Verify HMI signals correspond to item 1
- Verify telemetry signals
- Operating and control philosophy
- All external signals to be simulated

PS 9.16.17.3 Site Acceptance Test (SAT)

- Input & output testing of field wiring and marshalling
- Test all signals as per FAT

PS 9.16.17.4 Testing of Instruments

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 9.16.17.5 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 9.17 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.

PS 9.18 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 MAR001-E-001 and on the individual building or pump station drawings. Drawings may be issued to the contractor during the construction stages where they are not available during the tender stages.

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 9.19 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, structures and electrical installations 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 Client's 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 9.20 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 9.21 PREFERRED EQUIPMENT**PS 9.21.1 General**

The tenderer shall base his main tender price on the equipment listed and as specified. All equipment as far as possible shall be as supplied by Schneider.

The tenderer may however offer alternative equipment, but in this event:

- a) Alternative equipment offered shall be of financial and technical benefit to the project
- b) It shall be offered in a covering letter as an add or an omit to the main tender price.
- c) He shall submit sufficient documentation at the time of tender to allow the Client or Employer's Representative to evaluate the equipment.
- d) 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.
- e) 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.
- f) All alternatives shall be approved by the Employer's Representative or Engineer prior to the tenders closing.

PS 9.22 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 9.23 SPARE PARTS: ELECTRICAL and ANCILLIARY EQUIPMENT

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 9.24 PAINTING OF PANELS

Where sheet metal is used or where metallic surfaces are exposed to the air or in the presence of surface moisture and dusty environment, 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 epoxy 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 9.25 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 9.26 HAND OVER, O & M MANUALS AND DATA PACKS

The contractor shall supply and deliver to the Clients Representative or Engineer and Client 5 hard copies and 4 soft copies of the O & M manuals and data packs on successful testing and commissioning of the complete electrical, mechanical, process and instrumentation installations for the project made up as follows as a minimum:

- Electrical COC's (one for each MCC, DB and for each building or structure)
- Earth test certificates
- As built DB and MCC layouts and wiring diagrams
- As built motor control panel layouts and wiring diagrams including component lists
- MCC quality control and test reports
- FAT & SAT inspection and test reports
- Instrumentation equipment and details (flow meters, actuators, solenoid valves etc complete)
- Instrument 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.
- Instrument loop and block diagrams

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- Details of all pumping plant, valves, pumps, motors and other mechanical equipment used on the project
 - Details of all chemical dosing pumps and other equipment
 - Details of all instruments used on the project (flow meters, level sensors, level floats, flow switches, pressure switches etc)
 - Details of all dosing pumps and other equipment used on the project
 - All maintenance and servicing schedules of all electrical, instrumentation and mechanical Equipment
 - The operating and maintenance instructions for all electrical, instrumentation and mechanical equipment, valves, pumps, motors etc
 - OEM manuals of all mechanical, electrical and instrumentation equipment
 - Fault finding procedures and instructions
 - Supplier details of all major equipment
 - QCPs of all equipment (signed)
 - Calibration certificates of instruments and other equipment
 - Guarantee certificates
 - Pipework and plant drawings
 - As built drawings and site cable 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. Four (4) final copies of the manuals shall be provided both in hard copies and soft copies. 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 9.27 GUARANTEE, FINAL INSPECTION , MAINTENANCE, TRAINING & HAND-OVER

A final inspection will be conducted jointly by the Employer's Representative or Engineer, the Contractor or the Main Contractor on satisfactory completion of all official tests. This inspection may be phased where a Contract is to be taken over in sections by arrangement with all parties concerned.

A list of defects, remedial or incomplete works requiring attention will be drawn up following this inspection and issued to the Contractor for his immediate attention.

Once the items listed have been attended to the satisfaction of the Employer's Representative or Engineer, the Contractor shall issue a certificate of compliance, thereafter a completion certificate will be issued by the Employer's Representative or Engineer.

The contractor shall arrange for the handover of the completed electrical and mechanical installations to the Employer's Representative or Engineer and Client on successful commissioning of the works.

The complete electrical and instrumentation system shall be guaranteed for a period of twelve months from the date of the practical completion system when the Client takes beneficial use of the equipment.

During the guarantee period the contractor shall maintain the electrical and pumping system where applicable for a period of twelve months. The maintenance shall include greasing of all bearings and moving parts, topping up of any fluids, checking for loose connections and tightening of terminals and bolts, measuring insulation resistance, checking for vibration and noise and general conditioning monitoring on all pumps, motors, valves etc. The contractor shall also check that all indicator lights are working, test earth leakage units, test and check stop locks and all control circuitry and instrumentation or any other checks and tests that are required.

The project will not be signed off for payment and hand-over before all snags identified in the preliminary 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 9.28 SOLAR POWER INSTALLATION

a) 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.

b) 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

c) 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. Building Lighting			
1	Building lighting and small power	1	5kW LED	5Kw
	B. General Site Lighting			
2	Site LED lighting	1	5kW LED	5kW

	TOTAL LOAD		10kW
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d) 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
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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.

e) 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.

f) 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
(TBC - 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 mains incomer 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.

g) **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.

h) **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.

i) **SOLAR POWER - 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.

j) **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.

PS 9.28 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	Tenderer's Offer (to be as specified)
Variable speed drives and soft starters	Schneider	
Circuit Breakers , ACB's	Schneider	
Contactors, isolators, indication lamps	Schneider	
Relays, fuses, motor protection relay	Schneider	
Control switches, selector switches	Schneider, Krause and Naimer, ABB, Telemecanique	
Electronic Motor Controller	Schneider, Omron SEK	
Ammeter, voltmeter, current transformer, operations counter, hour meter.	Schneider, Hartmann and Braun	
Cables, Wire	Aberdare	
Cable trays , ladders , wire baskets, trunking	Cabstrut	
HRC fuses and holders	Schneider, G.E.C.	
DC Power Supplies	Schneider, 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	Schneider, York enclosures	
Power monitor	Schneider	
Open channel measurement flow meter	Siemens Milltronics Multiranger MR-200 DP 6R	
Radar level meter	Krohne, VEGA, Siemens	
Magnetic flow meter	Krohne, Siemens, Endress & Hauser	
Other flow meters	Kronhe, Siemens, Endress & Hauser	
Flow switches	IFM , EGE (electronic)	
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	

RETURNABLE SCHEDULES

**To be completed and submitted by
Tenderer and returned with Tender**

(Compulsory)

TECHNICAL DATA SHEET No. 1**RETURNABLE SCHEDULE FOR MOTOR CONTROL CENTRE (MCC)
(Complete one for each MCC and DB)**

Name of MCC or DB : _____

NO	Requirements	Minimum Require- ment	Tenderer offer	Tenderer Compliance
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 required. 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)			

TECHNICAL DATA SHEET No. 2**DIESEL STAND-BY GENERATOR****(Compulsory complete one for each generator)**

ITEM	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	OFFERED
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	
9,10	Supply Frequency	Hz	50	
9,11	Number of pole alternator circuit breakers	3 or 4	4	
9,12	Change over contactors or circuit breaker			
9,13	3 Pole main isolator	A		
9,14	3 Pole air circuit breakers with overload and short circuit protection	A		
10	CONTROL PANEL/INDICATION/INSTRUMENTS			
10,1	Automatic / Manual			
10,2	Remote / Local			
10,3	Type of controller			
10,4	Make of controller		Deep 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	OFFERED
12	OPERATING ENVIRONMENT			
12,1	Inland/Coastal		Coastal	
12,2	Inside /Outside		Outside	
12,3	Ingress Protection	IP		
12,4	Site Conditions – Altitude (MARGATE – KZN)	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 Capacity	%	%
13,3	Positing in cowling	Yes/No	Yes	

14	LOUVRES			
14,1	Louvres size according to Manufacturers Requirements	H X L X W		
14,2	Type		Acoustic	
14,3	Material of Construction		304L	
14,4	DB level required after acoustics louvres and sound proofing	DB	65	
15	GENERAL			
15,1	Warranty / guarantee - Engine	months	12	
15,2	Warranty / guarantee - Generator / Alternator	months	12	
15,3	Warranty / guarantee - Canopy	months	12	
15,4	Warranty / guarantee - Control panel	months	12	
15,5	Delivery time (after official order number received)	weeks		
15,6	Weight - Complete Generator Set	kg		
15,7	Largest Motor Load that can be started at once	kW		
15,8	Additional datasheet from manufacturer included with tender	Yes/No	Yes	
15,9	Servicing/maintenance	Yes/No		
15,10	COC required	Yes/No	Yes	
16	EXTRAS			
16,1	Fuel shut off valve	Yes/No	Yes	
16,2	Fireman switch	Yes/No	Yes	
16,3	Hand fuel pump	Yes/No	Yes	
16,4	Fuel level indicator with output to controller	Yes/No	Yes	
16,5	Fire detector and alarm system with signal to PLC required	Yes/No	Yes	
17	CANOPY / 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			
18.1				
18.2				
18.3				

TECHNICAL DATA SHEET No. 3**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	

TECHNICAL DATA SHEET No. 4**LOW VOLTAGE POWER CABLES, CONTROL CABLES, INSTRUMENTATION CABLES, CABLE LADDER AND PERFORATED CABLE TRAY**

DESCRIPTION	OFFERED
A) LV POWER CABLES	
Manufacturer	
Type	
SABS Approved	Y/N
In accordance with specification	Y/N
B) CONTROL CABLES	
Manufacturer	
Type	
Sizes (mm2)	
SABS Approved	Y/N
In accordance with specification	Y/N
C) INSTRUMENTATION CABLES	
Manufacturer	
Type of un-armoured cables	
Size/s(mm2)	
SABS Approved	Y/N
In accordance with specification	Y/N
Type and sizes of cable to remote ultrasonic flow metres (SWA)	
Type and sizes of cable to remote reservoir level switches (SWA)	
Type of signal boosters for long lengths of cables	
Other information	
D) CABLE LADDER	
Manufacturer	
Model/Range	
SABS Approved	Y/N
In accordance with specification	Y/N
PERFORATED CABLE TRAY	
Manufacturer	
Model/Range	
SABS Approved	Y/N
In accordance with specification	Y/N

TECHNICAL DATA SHEET No. 5

FIELD CONTROL STATIONS

NO	DESCRIPTION	OFFERED
1.	GENERAL	
1.1	Manufacturer	
1.2	Place of manufacture	
2.	EMERGENCY PUSH BUTTON	
2.1	Make	
2.2	Type	
2.3	Model	

TECHNICAL DATA SHEET No. 5**PROGRAMMABLE LOGIC CONTROLLERS (PLC) & SCADA
(Complete one for each PLC)****PLC :**

NO	DESCRIPTION	OFFERED
1.	GENERAL - PLC	
1.1	Manufacturer	
1.2	Model	
1.3	Type of PLC cabinet , manufacturer and physical size	
2.	PROCESSOR	
2.1	Model No.	
2.2	Maximum no. of racks	
2.3	I/O capacity (digital)	
2.4	I/O capacity (analogue)	
2.5	Memory capacity	
2.6	Memory extendable	
2.7	No of cards	
3.	I/O CARD	
3.1	Model No.	
3.2	I/O capacity - input/output (digital)	
3.3	I/O capacity - input/output (analogue)	
3.4	Total number required	
3.5	Type and number of expansion modules	
4.	POWER SUPPLY:	
4.1	Supply Voltage	
4.2	Maximum variation	
4.3	Backup facility	
5.	SOFTWARE:	
5.1	Programming language	
5.2	Logic	

SCADA :

NO	DESCRIPTION	OFFERED
1.	GENERAL - SCADA	
1.1	Manufacturer / Supplier	
1.2	Model	
1.3	Type	
1.4	Version	
1.5	Software	
1.6	Programming details	
1.7	Licenses	
1.8	Other hardware included	
1.9	Other details	
1.10	Other details provided	
2.	SCADA-MONITORS or SCREENS	
2.1	Model No.	
2.2	Type	
2.3	Resolution	
2.4	Size	
2.5	Other	

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TECHNICAL DATA SHEET No. 6**HMI SYSTEM**

NO	DESCRIPTION	OFFERED
1.	HMI	
1.1	Manufacturer	
1.2	Model	
1.3	Size of Screen	
2.	DISPLAY	
2.1	Size	
2.2	Type	
2.3	Monochrome / colour (State)	
2.4	Graphics capability (Yes/No)	
2.5	Number of pixels (Resolution)	
3.	DATA ENTRY KEYPAD	
3.1	Static and dynamic keys	
3.2	Service keys	
3.3	Alphanumeric keys	
4.	MEMORY	
4.1	Type	
4.2	Size	
4.3	Extendable?	
5.	COMMUNICATION PROTOCOL	
5.1	Specify:	
5.2	Other Information :	
6.	PROGRAMMING SOFTWARE	
6.1	Specify:	
6.2	Other Information	

TECHNICAL DATA SHEET No. 7**TELEMETRY SYSTEMS**

NO	DESCRIPTION	OFFERED
1.	BATTERY CHARGING UNIT	
1.1	Manufacturer	
1.2	Model	
1.3	Part Number	
1.4	Rating (VA)	
1.5	Maximum continuous current (A)	
2.	BATTERIES	
2.1	Manufacturer	
2.2	Model	
2.3	Type	
2.4	Ah Rating	
3.	GENERAL INFORMATION	
3.1	Back-up time (at full load)	
3.2	Battery Cabinet (Internal/external)	
3.3	Other	
4.	RADIOS / TELEMETRY EQUIPMENT	
4.1	Manufacturer	
4.2	Model	
4.3	Type	
4.4	Other	
5.	TRANSMITTER / RECEIVER	
5.1	Manufacturer	
5.2	Model	
5.3	Type	
5.4	Other	
6.	I/Os	
6.1	No of analogue inputs/outputs	
6.2	No of digital inputs/outputs	
6.3	Type	
6.4	Other	
7.	PLC/HMI	
7.1	Manufacturer	
7.2	Model	
7.3	Type	
7.4	Other Details	
8.	COMMUNICATIONS	
8.1	Protocol	
8.2	Frequency/band width	
8.3	Type of radio antennae	
8.4	Other	
9.	OTHER ANCILLIARY EQUIPMENT	
9.1	Manufacturer and type of telemetry panel	
9.2	Power supply required for telemetry panel	
9.3	Surge protection provided and type	
9.4	Physical size of telemetry panel	

TECHNICAL DATA SHEET No. 8**UNINTERRUPTIBLE POWER SUPPLY**

NO	DESCRIPTION	OFFERED
1.	BATTERY CHARGING UNIT	
1.1	Manufacturer	
1.2	Model	
1.3	Part Number	
1.4	Rating (VA)	
1.5	Maximum continuous current (A)	
2.	BATTERIES	
2.1	Manufacturer	
2.2	Model	
2.3	Type	
2.4	Ah Rating	
3.	GENERAL INFORMATION	
3.1	Back-up time (at full load)	
3.2	Battery Cabinet (Internal/external)	

TECHNICAL DATA SHEET No. 9**SWITCHES / FIELD CONTROL STATIONS , PRESSURE TRANSMITTERS, NO - FLOW SWITCHES & ELECTRIC VALVE ACTUATORS**

NO	DESCRIPTION	OFFERED
1.	GENERAL – SWITCHES / FIELD STATIONS	
1.1	Manufacturer	
1.2	Place of manufacture	
1.3	Type and Model	
2.	EMERGENCY PUSH BUTTON	
2.1	Make	
2.2	Type	
2.3	Model	

NO	DESCRIPTION	OFFERED
2.	PRESSURE TRANSMITTERS & MEASUREMENT:	
2.1	Manufacturer and model	
2.2	Sensor Type / Material	
2.3	Sensor Ranges	
2.4	Transmitter Type	
2.5	Transmitter Display Type	
2.6	Transmitter Supply voltage	
2.7	In accordance with specification	
		Y/N

NO	DESCRIPTION	OFFERED
3.	ELECTRIC VALVE ACTUATORS :	
3.1	Manufacturer and model	
3.2	Sensor Type / Material	
3.3	Sensor Ranges	
3.4	Transmitter Type	
3.5	Transmitter Display Type	
3.6	Transmitter Supply voltage	
3.7	In accordance with specification	
		Y/N

NO	DESCRIPTION	OFFERED
4.	ELECTRIC SLUICE GATES & ACTUATORS :	
4.1	Manufacturer and model	
4.2	Sensor Type / Material	
4.3	Sensor Ranges	
4.4	Transmitter Type	
4.5	Transmitter Display Type	
4.6	Transmitter Supply voltage	
4.7	In accordance with specification	
		Y/N

NO	DESCRIPTION	OFFERED
5.	NO- FLOW SWITCHES & MEASUREMENT:	
5.1	Manufacturer and model	
5.2	Sensor Type / Material	
5.3	Sensor Ranges	
5.4	Transmitter Type	
5.5	Transmitter Display Type	
5.6	Transmitter Supply voltage	
5.7	In accordance with specification	
		Y/N

TECHNICAL DATA SHEET No. 10**INSTRUMENTATION EQUIPMENT**

NO	DESCRIPTION	OFFERED
1.	ULTRASONIC LEVEL SENSOR & MEASUREMENT:	
1.1	Manufacturer and model	
1.2	Sensor Type / Material	
1.3	Sensor Ranges	
1.4	Transmitter Type	
1.5	Transmitter Display Type	
1.6	Transmitter Supply voltage	
1.7	In accordance with specification	
		Y/N
2.	FLOW MEASUREMENT:	
2.1	Manufacturer and model of ultrasonic /magnetic flow meter	
2.2	Sensor Type / Material	
2.3	Sensor Range	
2.3	Process Connection / Material	
2.4	Type of instrument cable supplied	
2.5	Other Details	
2.6	Transmitter Type	
2.7	Transmitter Display Type	
2.8	Transmitter Supply voltage	
2.9	In accordance with specification	
		Y/N
3.	LEVEL SWITCHES AND CONTROLLERS:	
3.1	Manufacturer and model	
3.2	Type / Material	
3.3	Arm length / Sensor distance	
3.3	Voltage	
3.4	In accordance with specification	
		Y/N
4.	LIMIT SWITCHES:	
4.1	Manufacturer and model	
4.2	Model	
4.3	Type / Material	
4.4	Switching Method and number of NO/NC contacts	
4.5	Voltage	
4.6	In accordance with specification	
		Y/N
5.	LEVEL FLOAT SWITCHES:	
5.1	Manufacturer	
5.2	Model	
5.3	Type / Material	
5.4	Switching Method and number of NO/NC contacts	
5.5	Voltage	
5.6	In accordance with specification	
		Y/N
6.	MOTOR & PUMP BEARING TEMP SENSORS	
6.1	Manufacturer	
6.2	Model	
6.3	Type / Material	
6.4	Switching or Operating Method	
6.5	Voltage	
6.6	In accordance with specification	
		Y/N
7.	MOTOR/PUMP BEARING VIBRATION SENSORS	
7.1	Manufacturer	
7.2	Model	

7.3	Type / Material	
7.4	Switching or Operating Method and Controller Data	
7.5	Voltage	
7.6	In accordance with specification	Y/N
8.	PUMP CASING TEMPERATURE SENSORS	
8.1	Manufacturer	
8.2	Model	
8.3	Type / Material	
8.4	Switching or Operating Method	
8.5	Voltage	
8.6	In accordance with specification	Y/N
9.	PUMP TACHOMETER SENSORS/ CONTROLLER	
9.1	Manufacturer	
9.2	Model	
9.3	Type / Material	
9.4	Switching or Operating Method	
9.5	Voltage	
9.6	In accordance with specification	Y/N

TECHNICAL DATA SHEET No. 11**LUMINAIRE'S AND SSO'S**

NO	DESCRIPTION - LUMINAIRES	OFFERED
1.	Type A :	
1.1	Manufacturer	
1.2	Wattage	
1.3	Type	
1.4	In accordance with specification (Y/N)	
2.	Type B :	
2.1	Manufacturer	
2.2	Wattage	
2.3	Type	
2.4	In accordance with specification (Y/N)	
3.	Type C :	
3.1	Manufacturer	
3.2	Wattage	
3.3	Type	
3.4	In accordance with specification (Y/N)	
4.	Type D :	
4.1	Manufacturer	
4.2	Wattage	
4.3	Type	
4.4	In accordance with specification (Y/N)	
5.	Type E :	
5.1	Manufacturer	
5.2	Wattage	
5.3	Type	
5.4	In accordance with specification (Y/N)	
6.	Type F :	
6.1	Manufacturer	
6.2	Wattage	
6.3	Type	
6.4	In accordance with specification (Y/N)	
7.	Type - J :	
7.1	Manufacturer	
7.2	Wattage	
7.3	Type	
7.4	In accordance with specification (Y/N)	
8.	Type - Other :	
8.1	Manufacturer	
8.2	Wattage	
8.3	Type	
8.4	In accordance with specification (Y/N)	
9.	Type - Other :	
9.1	Manufacturer	
9.2	Wattage	
9.3	Type	
9.4	In accordance with specification (Y/N)	

NO	DESCRIPTION – POWER OUTLETS	OFFERED
1.	Type: Switched Socket Outlet	
1.1	Manufacturer	
1.2	Rating	
1.3	Type	
1.4	In accordance with specification (Y/N)	
2.	Type: Light Switches	
2.1	Manufacturer	
2.2	Rating	
2.3	Type	
2.4	In accordance with specification (Y/N)	
3.	Type: Isolators	
3.1	Manufacturer	
3.2	Rating	
3.3	Type	
3.4	In accordance with specification (Y/N)	
4.	Type: Welding Sockets	
4.1	Manufacturer	
4.2	Rating	
4.3	Type	
4.4	In accordance with specification (Y/N)	

STANDARD GENERAL ELECTRICAL & INSTRUMENTATION SPECIFICATIONS

PUMPING AND WATER TREATMENT PLANT & 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.

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 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.

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.

irrespective

The starter cubicles for all motors rated at 2,2kW and above and all motor driven pumps

and an

of size shall be provided with an ammeter, which shall incorporate an adjustable red pointer

to be

extended starting characteristic. Allowance must be made for the full load current of all motors

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 $0.8 \times$ (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 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, Finnish, 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	:	≥ 98 % at nominal load
Output Voltage	:	0 - U_N , 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, over-speed, 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/s ²
Shock (IEC 68-2-29)	:	max. 100 m/ s ² , 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 ms , 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, 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
-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
TEES

DRAWINGS, EMPLOYER'S REPRESENTATIVE'S APPROVAL, GUARAN-

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

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 (Ref. to 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-ETHERNET	1
8	Wireless Router	WIFI	D-Link	N150	1

PS.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

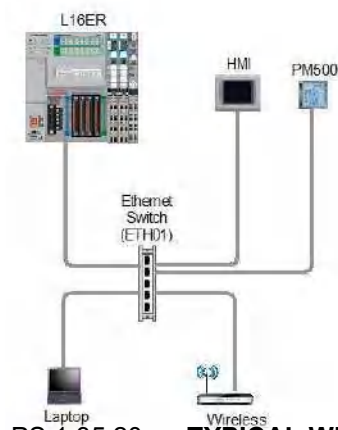
Digital Output Signals :

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

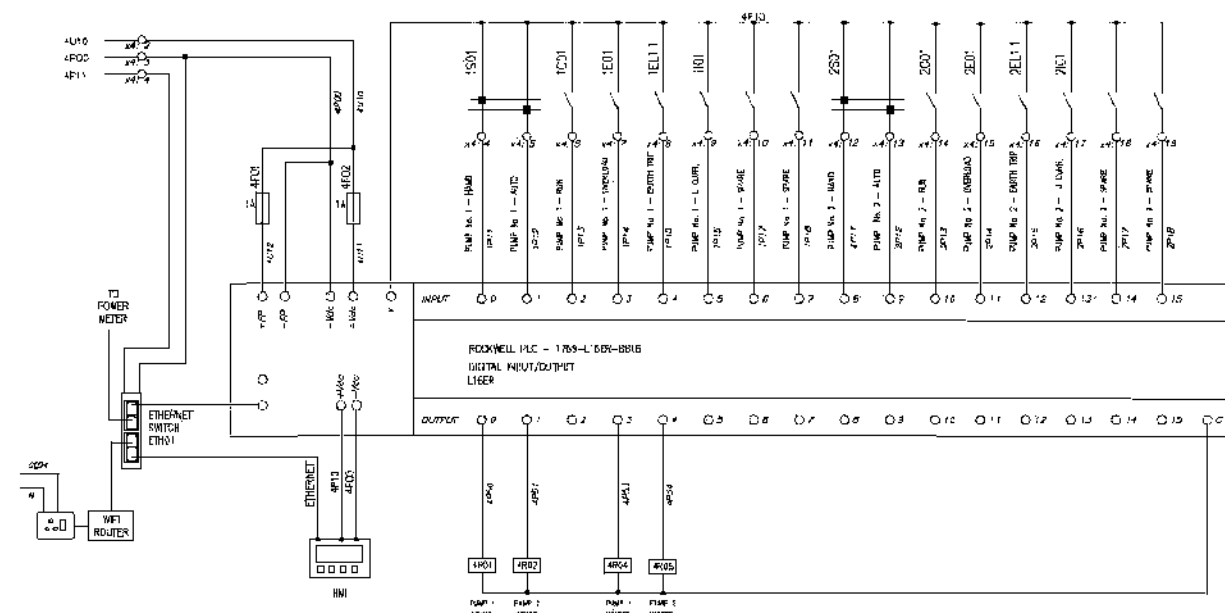
XX MIC 001 INHIBIT	Pump No. 1 – Inhibit	Local:1:O.Data.3	Module:1.3
XX MIC 002 INHIBIT	Pump No. 2 – Inhibit	Local:1:O.Data.4	Module:1.4
XX MIC 003 INHIBIT	Pump No. 3 – Spare	Local:1:O.Data.5	Module:1.5

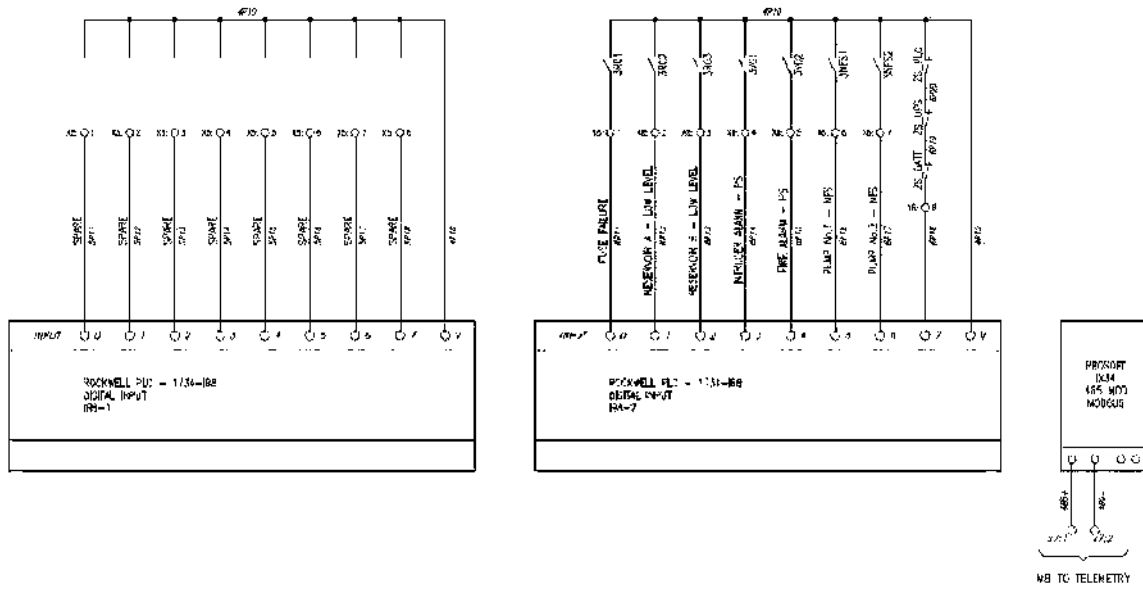
PS.1.35.19 TYPICAL NETWORK LAYOUT

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





PS.1.35.21 TYPICAL COMPLETE I/O INCLUDING TELEMETRY

Tan 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 11 Data 0	MBS DATA OutputRegister0	DIN1	x	x	x	x	
P1_AUTO	Pump No 1 - Auto	Local 11 Data 1	MBS DATA OutputRegister0.1	DIN2	x	x	x	x	
P1_RUN	Pump No 1 - Run	Local 11 Data 2	MBS DATA OutputRegister0.2	DIN3	x	x	x	x	
P1_OVERLOAD	Pump No 1 - Thermal Trip	Local 11 Data 3	MBS DATA OutputRegister0.3	DIN4	x	x	x	x	
P1_EARTH FAULT	Pump No 1 - Earth Fault Trip	Local 11 Data 4	MBS DATA OutputRegister0.4	DIN5	x	x	x	x	
P1_UNDER CURRENT	Pump No 1 - Under Current Trip	Local 11 Data 5	MBS DATA OutputRegister0.5	DIN6	x	x	x	x	
P1_FTS	Pump No 1 - Fail to Start	EWS Pump Sequence MIC 001_FTS	MBS DATA OutputRegister0.6	DIN7	x	x	x	x	
P1_NOS_ACTIVE	Pump No 1 - Number of Starts Exceeded	AP_MIC_001_RHM_NOS_LMT_ON	MBS DATA OutputRegister0.7	DIN8	x	x	x	x	
P2_HAND	Pump No 2 - Hand	Local 11 Data 8	MBS DATA OutputRegister01.0	DIN11	x	x	x	x	
P2_AUTO	Pump No 2 - Auto	Local 11 Data 9	MBS DATA OutputRegister01.1	DIN12	x	x	x	x	
P2_OVERLOAD	Pump No 2 - Run	Local 11 Data 10	MBS DATA OutputRegister01.2	DIN13	x	x	x	x	
P2_OVERLOAD	Pump No 2 - Thermal Trip	Local 11 Data 11	MBS DATA OutputRegister01.3	DIN14	x	x	x	x	
P2_EARTH FAULT	Pump No 2 - Earth Fault Trip	Local 11 Data 12	MBS DATA OutputRegister01.4	DIN15	x	x	x	x	
P2_UNDER CURRENT	Pump No 2 - Under Current Trip	Local 11 Data 13	MBS DATA OutputRegister01.5	DIN16	x	x	x	x	
P2_FTS	Pump No 2 - Fail to Start	EWS Pump Sequence MIC 002_FTS	MBS DATA OutputRegister1.0	DIN17	x	x	x	x	
P2_NOS_ACTIVE	Pump No 2 - Number of Starts Exceeded	AP_MIC_002_RHM_NOS_LMT_ON	MBS DATA OutputRegister1.1	DIN18	x	x	x	x	
SYS_FF	System - Fuse Failure	Local 31 Data 0	MBS DATA OutputRegister1.14	DIN31	x	x	x	x	
SYS_RES_A_LL	System - Reservoir 'A' Low Level	Local 31 Data 1	MBS DATA OutputRegister1.15	DIN32	x	x	x	x	
SYS_RES_B_LL	System - Reservoir 'B' Low Level	Local 31 Data 2	MBS DATA OutputRegister2.0	DIN33	x	x	x	x	
SYS_INT_AL	System - Intruder Alarm	Local 31 Data 3	MBS DATA OutputRegister2.1	DIN34	x	x	x	x	
SYS_FIRE_AL	System - Fire Alarm	Local 31 Data 4	MBS DATA OutputRegister2.2	DIN35	x	x	x	x	
SYS_P1_NFS	System - Pump No. 1 No Flow	Local 31 Data 5	MBS DATA OutputRegister2.3	DIN36	x	x	x	x	
SPS_P1_NFS	System - Pump No. 2 No Flow	Local 31 Data 6	MBS DATA OutputRegister2.4	DIN37	x	x	x	x	
SYS_BATT_ZS	System - Battery Box Limit	Local 31 Data 7	MBS DATA OutputRegister2.5	DIN38	x	x	x	x	
PM_L1_UV	Power Meter - Under Voltage (Red)	PW600-L1-UV	MBS DATA OutputRegister21.9	DIN41	x	x	x	x	
PM_L1_OV	Power Meter - Over Voltage (Red)	PW600-L1-OV	MBS DATA OutputRegister21.9	DIN42	x	x	x	x	
PM_L2_UV	Power Meter - Under Voltage (White)	PW600-L2-UV	MBS DATA OutputRegister21.10	DIN43	x	x	x	x	
PM_L2_OV	Power Meter - Over Voltage (White)	PW600-L2-OV	MBS DATA OutputRegister21.11	DIN44	x	x	x	x	
PM_L3_UV	Power Meter - Under Voltage (Blue)	PW600-L3-UV	MBS DATA OutputRegister21.12	DIN45	x	x	x	x	
PM_L3_OV	Power Meter - Over Voltage (Blue)	PW600-L3-OV	MBS DATA OutputRegister21.13	DIN46	x	x	x	x	
PM_P_SEQ	Power Meter - Phase Reversal	PW600-P-SEQ	MBS DATA OutputRegister21.14	DIN47	x	x	x	x	
PM_P_FAULT	Power Meter - General Fault	PW600-P-FLT	MBS DATA OutputRegister21.15	DIN48	x	x	x	x	
Analogue Signals									
PM_L12_INT	Power Meter - L1-L2 - Voltage	PW600-L12-INT	MBS DATA OutputRegister6	AIN6	x	x	x	x	
PM_L13_INT	Power Meter - L1-L3 - Voltage	PW600-L13-INT	MBS DATA OutputRegister7	AIN7	x	x	x	x	
PM_L23_INT	Power Meter - L2-L3 - Voltage	PW600-L23-INT	MBS DATA OutputRegister8	AIN8	x	x	x	x	
PM_C1_INT	Power Meter - L1 - Current	PW600-C1-INT	MBS DATA OutputRegister9	AIN9	x	x	x	x	
PM_C2_INT	Power Meter - L2 - Current	PW600-C2-INT	MBS DATA OutputRegister10	AIN10	x	x	x	x	
PM_C3_INT	Power Meter - L3 - Current	PW600-C3-INT	MBS DATA OutputRegister11	AIN11	x	x	x	x	
PM_KWH_INT	Power Meter - kWh Meter	PW600-KWH	MBS DATA OutputRegister12	AIN12	x	x	x	x	
P1_RHM_INT	Pump No 1 - Run Hour Meter	P1_RHM_INT	MBS DATA OutputRegister13	AIN13	x	x	x	x	
P1_NOS_INT	Pump No 1 - Number of Starts	P1_NOS_INT	MBS DATA OutputRegister14	AIN14	x	x	x	x	
P2_RHM_INT	Pump No 2 - Run Hour Meter	P2_RHM_INT	MBS DATA OutputRegister15	AIN15	x	x	x	x	
P2_NOS_INT	Pump No 2 - Number of Starts	P2_NOS_INT	MBS DATA OutputRegister16	AIN16	x	x	x	x	
Digital Signals									
AP_TELE_CALL_01	Telemetry Dvtr Call 1	AP_TELE_CALL_01	MBS DATA InputRegister381.0	DCUT1	x	x	x	x	
AP_TELE_CALL_02	Telemetry Dvtr Call 2	AP_TELE_CALL_02	MBS DATA InputRegister381.1	DCUT2	x	x	x	x	
AP_TELE_OR	Telemetry Override ON	AP_TELE_OR	MBS DATA InputRegister381.2	DCUT3	x	x	x	x	
AP_TELE_MIC_001_START	Telemetry Pump No. 1 - Start	AP_TELE_MIC_001_START	MBS DATA InputRegister381.3	DCUT4	x	x	x	x	
AP_TELE_MIC_002_START	Telemetry Pump No. 2 - Start	AP_TELE_MIC_002_START	MBS DATA InputRegister381.4	DCUT5	x	x	x	x	
Analogue Signals									
AP_LIT_001_PV	Elevated Tower Level	AP_LIT_001_PV	MBS DATA InputRegister27	AOUT27	x	x	x	x	
AP_LIT_002_PV	Suction Reservoir 'A' - Level	AP_LIT_002_PV	MBS DATA InputRegister29	AOUT29	x	x	x	x	
AP_LIT_003_PV	Suction Reservoir 'B' - Level	AP_LIT_003_PV	MBS DATA InputRegister31	AOUT31	x	x	x	x	
AP_FIT_001_PV	Inlet Flowmeter - Flow Rate	AP_FIT_001_PV	MBS DATA InputRegister33	AOUT33	x	x	x	x	

SECTION ELE 3: STANDARD TECHNICAL SPECIFICATION: GENERAL LV ELECTRICAL INSTALLATION**CONTENTS**

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1 CABLES

The Contractor shall supply and install all cables as shown on the drawings and the single line diagrams.

All cables shall be 600/1000 V, PVCA armoured type having stranded annealed copper conductors and ECC conductors and shall comply with SANS 1507 as amended.

All routes, lengths and size shall be as indicated on the drawings and as specified. The final cable routes must be determined on site in conjunction with the Engineer.

The actual cable lengths must be measured on site before ordering the cables. The cable lengths must be measured from conductor termination to conductor termination as no payment will be made for superfluous cable. The tender price will be adjusted if the actual cable length installed differs from that specified. The adjustment will be made according to the rate tendered for the particular cable size concerned.

The storage, transportation, handling and laying of the underground cables shall be in accordance with first class practice and the Contractor shall have adequate and suitable equipment and labour to ensure that no damage is done to the cables during such operations.

- i. The handling and laying of cables shall be carried out in accordance with the following: -
- ii. Cable laying shall not commence until the trenches have been inspected and approved;
- iii. Cables shall not be subjected to any undue tension, twists, kinks of any type or improper
- iv. Handling;
- v. The inside radius shall be greater than 12 times the overall diameter of the cable;
- vi. Care shall be taken where cables are drawn through sleeves and ducts to avoid abrasion, elongation or distortion of any kind. The ends of such sleeves shall be sealed off to the approval of the Engineer after drawing-in of cables;
- vii. Adequate slack shall be allowed for the termination of cables;
- viii. No outdoor cable work shall be carried out during inclement weather. Where cables are cut and not immediately made-off, the ends are to be sealed without delay to protect the cable against ingress of moisture;
- ix. Cables installed in trenches shall be laid at least 150 mm apart over a 75 mm bedding of sifted ground (free of clay) or soft sand. The trench shall then be backfilled with a 75 mm layer of sifted ground or soft soil and then compacted. The trench shall then be filled and compacted in 150 mm layers to the top; and
- x. PVC cable warning tape shall be installed at 300 mm below ground level directly above the cables along the entire cable routes.
- xi. 50 mm thick pre-cast concrete slabs, measuring approximately 300 x 600 mm, shall be laid over 75 mm of soil bed covering the MV cables along the entire route of such cables.

Cables shall be terminated by means of suitable cable glands and neoprene shrouds of an approved make using the manufacturers recommended method. All terminations must be such that the armouring is bonded to the metal gland plate. Where cables are not glanded-off onto a gland plate, the armouring shall be bonded to the earth bar or terminal using a suitable earthing ring. Cable glands and accessories shall comply with SANS 1213 as amended.

The top of all underground cables shall be installed at the following depths below finished ground (BFGL) or road surface level as applicable: -

IN GENERAL AREAS	UNDER ROADS OR	LOAD BEARING AREAS
LV/Control cables	600 mm	800 mm
MV cables	1000 mm	1000 mm

LV cables within garden areas shall installed at a depth of 800 mm BFGL.

Where specified, suitable cable markers shall be installed to mark the position and change of direction of all cable routes.

2 CABLE ACCESS SLEEVES AND MANHOLES

The Contractor shall supply and install all the cable access sleeves as indicated on the drawings and as specified.

It shall be the responsibility of the Contractor to ensure that all the sleeves are correctly installed.

All underground sleeves shall, unless where otherwise specified, comprise uPVC pipes.

Where cables cross under roadways or other load bearing areas the cables shall be installed in asbestos-cement pipes, earthenware or high density polyethylene sleeves. In all such cases the top of the sleeves shall be not less than 800 mm below the finished level of the road surface.

The top of all underground sleeves, which are installed in general areas other than roadways and load bearing areas, shall be not less than 600 mm below finished ground level. PVC warning tape shall be installed 300 mm below finished ground level directly above the sleeves.

Suitable large radius or easy bends shall be allowed where sleeves are to terminate in distribution boards or

draw boxes. Before backfilling the ends of all used and unused sleeves shall be sealed with suitable non-hardening watertight compound.

Where applicable all manholes required for the electrical installation shall be installed by the Building Contractor. Sleeves terminating in manholes are to be positioned to provide maximum cable bending radius.

All exposed cables entering any floor sleeve shall be protected with heavy duty hot dip galvanised steel 'kicker' pipes to a minimum height of 1000 mm AFFL. This shall also apply to cables that either enter or exit a building against outside walls.

3 EXCAVATIONS AND BACKFILLING

The contractor shall acquaint himself with the position of existing services such as stormwater pipes, water mains, telephone cables, etc. and take the necessary precautions before commencing excavations to prevent disruption of these services. Any damage caused by the Contractor to these services shall be repaired at his cost.

The Contractor shall take the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.

The Contractor shall take the necessary precautions to safeguard existing structures, sewerage works, water reticulation works, roads or other property on the site from any damage or risk of subsidence.

Cable trenches for underground LV cables installed in general areas shall be excavated to a depth of not less than 750 mm below ground level and the width shall not be more than 400 mm for one or two cables. The depth of trenches under roads and load bearing areas as well as for MV cables shall be adjusted to provide the minimum cover as indicated in item (B1.1).

The width shall be increased where more than two cables are laid together so that the cables may be spaced at least 150 mm apart throughout the run. The bottom of the trench shall be level and clear and the bottom sides free from rocks or stones liable to cause damage to the cables.

Cable trenches may not be backfilled before the cables laid on the bedding have been inspected and the cables have been tested. Cable trench shall be backfilled and properly compacted in layers with suitable hand tampers

or mechanical stampers to ensure that there is no subsidence. During compaction the soil may have to be moistened to a optimum moisture content to attain an adequate compaction density. If suitable backfill material is not available at the trenches, the Contractor shall obtain it elsewhere at no additional cost.

All surplus ground and rocks shall be removed from the site of works and this cost be included in the Contractor's tender price.

Where called for, prices for additional trenching shall be based on the various types of ground as specified below:

HARD ROCK shall mean granite, quartzitic sandstone, slate and rock of a similar or greater hardness, solid shale and boulders over 0.03 m³ in volume.

SOFT ROCK shall mean rock that can be loosened by hand -pick and includes hard shale, compact oukclip and boulders from 75 mm in diameter up to 0.03 m³ in volume.

EARTH shall mean ground that can be removed by pick and hand shovel and includes loose gravel, clay, made-up ground, loose or soft shale, loose oukclip and boulders less than 75 mm in diameter.

No guarantee is given or implied that blasting shall be required but should this method of removal be necessary and permitted, then the Contractor shall take all responsibility and observe all conditions as set forth in Government and Local Authority regulations.

4 DISTRIBUTION BOARDS

All boards shall be to the approval of, and shall comply with, the standards and with the regulations of the Supply Authority, and it shall be the responsibility of the Contractor to establish and provide such requirements and obtain approval where necessary.

Distribution boards shall be as indicated on the DB schedules and single line diagrams and shall comply with SANS 1765 and SANS 60439-1.

The Contractor shall implement the manufacture of distribution boards as soon as possible after being appointed to ensure their timely delivery to site.

The Contractor shall submit DB workshop drawings to the Electrical Engineer for reviewing before the boards are to be manufacture. The fully completed boards are to be inspected at the manufacturer's premises by the Engineer before they can be delivered to site.

Distribution boards shall be manufactured by a reputable firm which is a specialist in the field and who shall install and fit the switchgear and equipment and carry out all the internal wiring.

General purpose boards installed indoors shall, unless otherwise specified, be manufactured from pre-

galvanised sheet steel with an epoxy paint with colour finish to the Engineer's approval. The sheet steel thickness for main boards as well as for all free-standing boards shall be 1.6 mm and for sub-boards 1.2 mm. The interior of boards shall have a white epoxy paint finish and the base/plinth frame on free-standing boards shall be with a corrosion resistant black paint.

Boards or kiosks installed outdoors or in exposed or corrosive areas shall, unless otherwise specified, be manufactured from 3CR12 sheet steel, including mounting brackets and cover plates, and shall have epoxy paint with colour finish as specified. The colour finish for outdoor kiosks shall be "Biscuit" (B64) to SANS 1091, or as otherwise specified.

All boards shall be dust and vermin proof, all doors and external cover plates shall be fitted with 30 mm wide x 10 mm thick high-density neoprene gaskets. All boards mounted externally or internally in dusty or corrosive environments or where specified shall have a double gasket arrangement, whereby one gasket is fixed to the fixed part of the enclosure and the other to the door or removable part. The gaskets shall line-up when the doors or covers are in a closed position. Additional door stiffeners shall be provided on long doors on free-standing boards to prevent air-gaps between the gaskets when the doors are closed.

Where necessary, boards containing heat-producing equipment shall be adequately ventilated by means of suitable ventilators and or louvers, strategically placed, to ensure a good air flow within the enclosed cabinets. All louvers shall be adequately sealed with suitable mesh.

The boards shall be manufactured with sufficient space to provide easy access for wiring, connecting and maintenance purposes. Adequate space shall be provided between banks of circuit breakers, between contactors and between the end of circuit breakers or other switchgear and the side of boards, to ensure that there is sufficient space for wiring, connecting and maintenance purposes. A minimum space of 80 mm shall be allowed for this purpose.

Unless otherwise specified, space only and mounting facilities shall be provided for 30% future expansion of circuit breakers and 30% for contactors and relays.

Doors shall be of rigid construction and shall not exceed 700 mm. Door hinges and catch shall be "Barker & Nelson" or similar and approved. Cover plates shall be retained with twist-lock captive square-keyed fixing device. Outdoor boards/kiosks shall be equipped with flush stainless-steel hinges, which are not easily vandalised. The padlockable door catch on outdoor kiosks shall be of stainless steel and be protected with an approved anti-theft cover with bottom access only.

Where specified, the boards shall be extendable and the busbars shall be suitably pre-drilled and fitted with cadmium plated high tensile bolts, nuts spring washers and brass washers for this purpose.

All removable cover plates shall be fitted with an adequate number of square pattern key locks.

Where pre-fitted space for future equipment is called for, this shall include pre-drilled chassis, cut-outs in panel with suitable blanking-off plates and adequate pre-drilled busbar extensions for terminating outgoing feeders.

Suitably sized collector bars shall be provided on all equipment requiring parallel cables.

All busbars and any other uninsulated connecting links shall be taped or sleeved by the board manufacturer except at joints and take offs, which shall be tapped after installation of boards and cables thereto. Correct colour coding of phases must be maintained.

The boards and all components mounted therein shall be able to withstand the specified prospective fault current.

The fault level rating of circuit breakers used in domestic applications shall be 2.5 kA and in commercial/industrial applications, not less than 5 kA. Circuit breakers shall be "CBI", "M&G" manufacture or similar and approved by the Engineer. Boards with fault level ratings less than 10 kA shall comply with SANS 1765 and fault levels equal to or greater than 10 kA with SANS 60439-1.

Type test reports shall be provided, for verification purposes, with all boards with fault levels greater than 10 kA.

Combined lightning current and surge voltage arresters, for use in distribution boards, shall comply with SANS IEC 61643-1. The arresters shall be Class I 65 kA (I max) and Class II 10 kA (I max) or 40 kA (I max) as specified. The arresters shall be modular and shall have an easily identifiable failure indication feature so that each module can be replaced separately. Back-up fuses shall be provided where the board fault level exceeds 5 kA. Class 1 (65 kA) arresters shall be used in all main boards and class 2 (40 kA) in all sub-boards.

All boards shall have a main designation label on the outside frame and a main label fixed to the cover plate. All equipment shall be adequately labelled as shown on the drawings and DB schedules. A legend card and holder shall be provided on the inside of the door. Details of circuits and locations of outlet typed thereon shall be as shown on the single line diagram and board arrangement drawing. All designation labels shall be of a heavy 'Ivorene' sandwich plastic type. The size of the letters for the main designation labels shall be 20 mm, for the CB labels 10 mm and for the main labels 5 mm.

All switchboards rated at 800 A or greater, shall be fitted with network analysers and appropriately rated Class 10P10 indication CT's. The analysers shall be able to indicate instantaneous and maximum values of phase

current, phase and line voltage, active and reactive power, power factor, frequency, harmonic current and voltage distortion, system current value and % imbalance. The analysers shall be able to be networked to a 'Modbus' system and shall be "LOVATO" DMK32 or similar and approved.

CB's with built-in network analysers shall be provided with suitable 'Modbus' interface devices. A 24 V dc supply shall be provided in the board to supply all the relevant interface devices.

All motor control centre (MCC) switchboards shall be manufactured from 3CR12 stainless steel using 1,6 mm thick sheet steel externally and 1.2 mm internally. They shall have a minimum of three separately accessible sections for distribution, main controls and motor control as indicated on the electrical schematic diagrams.

The three sections shall have adequate space to accommodate all the necessary switchgear, wiring trunking, termination blocks, labelling and space for spare ways. Where specified, PLC's shall be incorporated in the main control section of the switchboard.

All hinged doors shall be earthed and provided with flexible plastic-coated steel wire restraints. All the wiring required for door-mounted devices shall be neatly loomed and shall allow for free movement of the doors without exerting unnecessary stress on the wiring and the equipment connected thereto.

The switchgear required for each motor starter and the associated controls shall be housed in separate cubicle enclosures within the MCC, each having a hinged door. The cubicles shall be equipped with door interlocking handles that allows the door to be opened only when in the 'off' position. Provisions shall be made so as to isolate the control circuit when the door is open.

All emergency stop actuators mounted on MCC's shall be of the 'Push-to-activate' or 'Twist-to-release' type and shall have 40 mm diameter illuminated mushroom heads. The diameter of all other push-buttons as well as indication lights shall be 22 mm. All push-buttons and indication lights shall be manufactured from a robust plastic and shall have an IP 65 rating.

All control wiring shall be identified with suitable markers in accordance with the drawings and schematic diagrams and shall be terminated in suitably labelled 'Klipon' type terminals or similar and approved by the Engineer. Outgoing control wiring from / to remote or field controls shall be terminated in separate terminal blocks. Likewise, all PLC's I / O's as well as all interface devices shall be terminated in separate terminal blocks.

It shall be the responsibility of the Contractor to provide the Switchboard Manufacturer with all the relevant information regarding the details of the space and access of the rooms, in which the boards are to be accommodated, as well as entry details of cables, pipes and trenches, etc., to ensure the boards are correctly manufactured.

Meter frames shall be as indicated on the single line diagrams and shall be to the approval of the Supply Authority.

All boards shall be inspected by the Engineer, on completion of manufacture, but only after inspection and acceptance by the Contractor and prior to despatch from the manufacturer's works. The Contractor shall advise the engineer in good time, of such completion and acceptance.

The Contractor shall ensure that all terminations are checked and tightened when receiving the distribution boards on site and before commissioning the installation.

On completion of the installation the Contractor shall provide a detailed designation list of all circuits on all boards and shall undertake the load testing of all circuits to ensure equal load balancing across the three phases. The Contractor shall also adjust the earth fault (Im) settings on all the adjustable circuit breakers as indicated on the final issue of the cable schedule and the 'As-built' network diagram.

5 WIRING

Wiring of the installation shall be carried out with PVC insulated 300 / 500 V grade stranded annealed copper conductors complying with SANS 150 as amended and which shall bear the SANS mark.

No open wiring nor the drawing of mixed circuits nor the drawing of more than two circuits of the same load per conduit will be permitted

Unless otherwise specified or indicated on the single line diagrams the minimum conductor size of the following sub-circuits shall be as follows: -

Lighting	-	2x2.5 mm ² + 1.5 mm ² EW
Socket outlets	-	2x2.5 or 4mm ² + 2.5 mm ² EW
Geysers	-	2x4 mm ² + 2.5 mm ² EW
Stoves	-	2x6/10 mm ² + 4/6 mm ² EW
Control wiring in control panel	-	1.5 mm ²

All wiring of individual circuits shall be harnessed together to facilitate the ease of identification of such circuits.

The wiring in spaces above ceilings with removable suspended ceiling tiles shall be wired via a suspended galvanised steel trunking system with 5 A socket outlets in order to provide maximum flexibility.

The wiring in hard board ceilings, where the space above the ceiling is not accessible from below the ceiling,

shall be such that it can be re-wired from below the ceiling.

The wiring in metal-framed demountable or removable partitioning shall be carried out through the hollow frame of the partitioning to switches, socket outlets and other outlets. The Contractor shall use architrave switches suitable for fitting in the partitioning members and shall trim the partitioning as necessary to ensure neat level fixing of the switches and power outlet plates.

6 WIREWAYS

All conduits, outlet boxes and DB trays, etc., shall be fixed in position by the Contractor, and built-in by the Builder. Where, in exceptional cases, this is not possible, chasing will be permitted. Chasing into face brick or plastered wall, as well as concrete structure, will not be permitted without prior written consent. The Contractor will be held responsible for any damage to Builder's work due to non-compliance in this regard. Where conduit or trunking size is not specified it shall be sized to accommodate all wiring plus space for a further 25% of wiring such that a space of 40% of the wireway is not exceeded.

6.1 CONDUIT

The Contractor shall ensure that all conduit work is completed timeously, so as not to delay building operations, and shall advise the Engineer, in good time, of such intended completion, that it may be inspected prior to being covered up. The Contractor shall attend on the Engineer during all such inspections.

Unless otherwise specified, all conduit concealed in floor slabs, walls, building structure and ceiling voids shall be PVC. No surface mounted PVC conduit will be permitted other than in ceilings. Conduit mounted on finished surfaces shall be of hot-dipped galvanised type installed on raised saddles. Electro plated galvanizing will not be accepted.

The tubing shall enable the loop-in wiring system to be followed throughout the installation. The Contractor shall allow 25% spare conduit between all flush mounted distribution boards and ceiling spaces.

Where conduit outlet boxes or draw boxes are mounted on finished surfaces, the Contractor shall ensure that such outlets are mounted symmetrically. It will not be sufficient to scale the positions of any outlet off drawings. No additional payment will be allowed where outlets are not mounted symmetrically and have to be changed.

Conduit outlet boxes for lighting circuits shall of the deep type or be fitted with extension rings.

Draw boxes with blank covers shall be allowed for, in the conduit runs as necessary. Draw boxes with sliding conduit shall be installed where conduit crosses expansion joints. Galvanised draw-wire of 1,6 mm diameter shall be drawn in all conduit provided for other services.

Conduit in roof spaces must be installed neatly and must wherever possible run along and/or at right angles to roof trusses and must not cross-over.

At building expansion joints, all the conduits must be provided with conduit expansion joints with a positive earth wire connection.

'Kopex' or other approved flexible conduit shall be used to connect movable appliances complete with approved connectors, etc. Earth conductors shall be installed together with PVC conductors in flexible conduit to ensure earth continuity.

Where specified steel conduit shall be plain-end hot dip galvanised.

6.2 CONDUIT OUTLET BOXES

Round conduit boxes shall be not less than 50 mm deep PVC with brass screw inserts. Outlet boxes for switches and power points shall be 100 x 50 mm and 100 x 100 mm galvanised steel.

6.3 TRUNKING

Trunking shall be galvanised steel or plastic of type and size as specified and shall be installed in the positions indicated on the drawings.

Trunking shall come complete with all the necessary accessories. Suitable galvanised steel hangers and rods shall be provided where trunking is suspended.

Unless otherwise specified, trunking shall be mounted with open side facing upwards. Suitable purpose made wiring supports shall be provided when the trunking is mounted with open side downwards.

Trunking installed against indoor surfaces in commercial and office areas shall be painted. The paint work shall comprise a primer coat, undercoat and two final coats of epoxy paint with colour finish to be advised by the Engineer or Architect.

6.4 POWERSKIRTING

Unless otherwise specified, all power skirting shall be mounted at floor skirting height and shall be of the 3-compartment type made from 0.9 mm thick steel with an epoxy paint finish to the Architect's approval.

The power skirting shall come complete with purpose made accessories. Conduit access to the power skirting shall be via flush mounted 100 x 50 steel boxes set behind the trunking. Slots cut/punched into the trunking for wiring purposes shall be free of sharp edges.

Where power skirting is interrupted by doorways, etc., conduit of not less than 32mm diameter shall be

provided to bridge the break in each compartment.

The power skirting shall be "O-LINE , CABSTRUT GC Classic Skirt" or similar and approved.

The power skirting compartments shall be utilised as follows:

Upper compartment	-	Power
Centre compartment	-	Communication, etc.
Lower compartment	-	Telephone

6.5 FLOOR DUCT / BOXES

Unless otherwise specified, floor duct shall of the heavy duty three (3) compartment type measuring 215 mm x 31 mm high with floor boxes to mount outlet units at 1500 mm intervals. Ancillary equipment, such as floor/junction boxes, removable bridging pieces, pedestal plugs, etc shall be specifically manufactured to fit this floor ducting.

The installation of the floor duct shall be undertaken in conjunction with the Builder, who shall be required to provide a level screed bed onto which the Contractor shall securely install the floor duct. This floor duct shall form the upper level of the final floor screed.

Floor boxes shall have a 200 x 300 PVC frame and lid and shall be fitted with 8-way modular outlet plates.

The lids of floor boxes installed in carpeted areas shall be fitted with carpet to suit.,

The lids of floor boxes installed in tiled floor areas shall be fitted with a 3 mm thick reinforcing pre-galvanized steel plate and covered with several layers of epoxy to match the adjacent tiles.

The top layer of epoxy shall be flush with the top of the lid. Floor boxes shall be "O-LINE, CABSTRUT" or similar and approved.

6.6 CABLE TRAY / LADDER

Where specified, light duty cable tray shall be manufactured from perforated galvanized rolled steel with a minimum thickness of 1,2 mm. The trays shall have an upstand of 19 mm on either side. Trays shall be installed with all bends, T-junctions and all other accessories required.

Where specified, medium duty cable tray shall be manufactured from perforated rolled steel with a minimum thickness of 1,6 mm. The trays shall have an upstand of 38 mm on either side and shall be HDGS to SANS 787.

Where specified, heavy duty welded wire mesh cable tray shall be manufactured from 5mm steel wire. The tray shall have a 75 mm upstand on either side and shall be HDGS to SANS 787.

Where specified, medium duty cable ladder shall be manufactured from rolled steel with a minimum thickness of 1,6 mm. The ladder shall have an upstand of 76 mm on either side and rungs shall be spaced at not less than 375 mm. The ladder shall be HDGS to SANS 787.

Heavy duty cable ladder shall be manufactured from rolled steel with a minimum thickness of 2 mm. The ladder shall have an upstand of 76 or 100 mm on either side and rungs shall be spaced at not less than 300 mm. Suspended cable tray or medium duty cable ladder shall be supported by means of P2000 trunking and 8 mm HDGS threaded rod. Suspended heavy duty cable ladder shall be supported by means of P1000 trunking and 10 mm HDGS threaded rod.

Tray and Ladder shall be installed with all bends, T-junctions and all other accessories that are required.

The cable tray and ladder shall be "CABSTRUT" or similar and approved.

6.7 JUNCTION BOXES

Where specified, all junction boxes shall have a minimum IP65 protection rating. The sealing of the boxes shall be by means of a tongue-and-groove arrangement together with a continuous O-ring silicon seal.

The integrity of all junction boxes shall be maintained after fixing to a surface and termination of all cables.

The method of fixing shall be approved by the Engineer. All incoming and outgoing cables shall be terminated at the bottom of the boxes. The glands shall have an IP rating equal to or better than that of the box.

The termination of conductors or wires in junction boxes shall be carried out with suitably sized DIN-rail mounted block connectors. The Din-rail shall be mounted on a suitable block board or non-corrosive facilities plate.

The junction boxes shall be adequately sized to allow for ease of installation and adequate space to neatly loom the conductors / wires.

Adequate labelling and circuit details shall be provided inside and outside the boxes, as required.

7 LIGHTING CONTROL DEVICES

The devices used for lighting control shall be as indicated on the layout drawings or DB schedules.

All switches shall be labelled with suitable labels indicating the circuit number shown on the 'As-built' record drawings shall be provided on the inside of all cover plates. The label shall be permanently fixed and shall indicate the DB from which it is fed and the circuit number i.e. DB-1/L2.

7.1 LIGHT SWITCHES

All indoor light switches shall comply with SANS 163 and shall be rated at 16 A, 250 V and be installed

in 100x50x50 mm flush galvanised steel boxes with white metal cover plates as manufactured by "CRAB-TREE" or similar and approved.

Outdoor switches shall be of the IP65 type in polyester enclosures and shall be rated at 16 A, 250 V as manufactured by "LEGRAND", "CLIPSAL", "CRABTREE" or similar and approved.

Key switches shall be of the modular type, which can be fitted to the cradle of a standard 50 x 100 flush box and shall have the same cover plate as that used for the light switches. The key switch shall be rated at 16 A, 250 V as manufactured by "LEGRAND", "CLIPSAL", "CRABTREE" or similar and approved.

7.2 PEC DAYLIGHT SWITCHES

Light sensitive photo-electric control (PEC) daylight switches equal or similar to "National, Royce Thompson" shall be installed in an approved bulkhead fitting for the control of outside lights. The daylight switch shall be of the fail-safe type and shall comprise a photo-electric cell, thermal actuator, a change-over switch rated at 10 A, 230 V and a 15 second time delay. The unit shall be housed in an empty "BEKABULK" bulkhead fitting having a rectangular aluminium base and a high impact acrylic diffuser. The bulkhead fitting shall be installed vertically on a wall or surface at a suitable location, which, unless otherwise shown, has a north-westerly aspect. The Contractor shall ensure that the operation of the daylight switch is not affected by nearby light fittings. PEC switches in outdoor kiosks shall be of the miniature type and shall be installed in front of a small aperture, which is protected with a suitable glass visor or screen.

7.3 PROXIMITY SWITCHES

Proximity sensors shall be of the digital PIR type with sealed optics and shall be suitable for mounting on ceilings or on walls.

Ceiling mounted sensors shall have a true coverage of 360° horizontally and 110° vertically.

Wall mounted sensors shall be of the type suitable for installing in flush 50 x 100 switch boxes.

The proximity sensors shall have an adjustable switch-off delay of 1 to 60 min and have an ohmic load switching capacity of 10 A.

The proximity sensors shall be "SCHNEIDER", "LEGRAND" or similar approved.

7.4 MULTI-FUNCTION SENSORS

Multi-function sensors shall be of the digital PIR type with sealed optics. They shall have a presence and daylight detection functions and shall have a true coverage of 360° horizontally and 110° vertically.

Multi-function sensors shall have an adjustable switch-off delay of 1 to 30 min and have an ohmic load switching capacity of 5 A.

It shall be possible to network the multi-function sensors DALI (Digital Addressable Lighting Interface) ECG's (Electronic Control Gear) ballasts via the DALI bus system. It shall also be possible to compensate for up to 100% of the incoming daylight.

8 LIGHT FITTINGS

All light fittings to be manufactured to SANS Class 'C' safety standard as well SANS Class 'A' performance standard or an equivalent or recognised international quality standard. The light fittings as specified in the project specification shall take precedence.

All fluorescent light fittings for use within buildings shall be manufactured from 0.8 mm pre-galvanized sheet steel. Anodized aluminium frames shall be used to fix and support the diffuser or reflector system in recessed light fittings. The frame shall be retained to the light fitting enclosure by means of sturdy spring steel clips, which enables the frame to be hinged.

Light fittings with aluminium housings, which are mounted outdoors or in exposed areas, shall be manufactured from low copper 'LM6' alloy. The use of aluminium alloys with higher copper content will not be acceptable.

Light fittings shall be as specified and shall be supplied complete with approved lamps and protective and suitable protective covering.

Where the fittings are supplied by the Client and handed over to the Contractor, the Contractor shall check, store and install the fittings at the positions shown on the layout drawings. The Contractor shall be responsible for the fittings from the time they are handed over to him until the final acceptance of the installation by the Client.

Lamps and electrical components used in fittings shall comply with the relevant SANS standard and wherever possible shall bear the SANS mark or alternatively shall indicate compliance with the equivalent IEC standard. No-name brands are not acceptable.

All fluorescent lamps shall be of the high frequency type controlled with ECG ballasts. The lamps shall have colour temperature of 4 000°K and a CRI (colour rendering index) of ≥ 80.

All DALI ECG ballasts shall be equipped with removable programmable cards. All light fittings equipped with DALI ballasts shall be fitted with a suitable DALI socket flush mounted on the side of the fitting for connecting to the DALI bus network.

All emergency lighting fittings shall comply with SANS 10114-2. Unless otherwise specified, emergency lighting battery units installed within or adjacent to the luminaries shall be of the maintained mode type and are capable of operating one lamp at 20% light output for 60 minutes. The unit shall have a self-testing facility that constantly monitors the status of the unit and discharges the nickel-cadmium hydride batteries on a regular basis. An LED status indication lamp shall be provided in a clearly visible position in/on the fitting.

Light fittings with LED lamps shall have adequate ventilation and heat dissipation characteristics, such that the temperature rise between the LED 'PNP' junction and the outer surface of the heat sink shall be not $>10^{\circ}\text{C}$.

The LED lamps used shall be from a 'close bin' selection and have a colour appearance variation tolerance of not more than $\pm 50^{\circ}\text{K}$, with a nominal colour temperature of 4000°K to 4500°K operating current of LED lamps will vary from about 100 mA for LED strips to about 1 000 mA for light fittings with good heat dissipation properties. LED strip shall be mounted on suitable heat-dissipating aluminium extrusions.

The average life of the LED lamps operating within the specified light fitting shall not be less than 50 000 hrs @ L90.

The LED control driver shall be able to have anti heat-rise or electronic overheating prevention controls and shall have a power factor ≥ 0.95 .

LED light fittings operating outdoors shall be equipped with a minimum of 10 kA, Class II surge arresters.

Electro-magnetic interference (EMI) from LED's, control drivers and all lighting related products shall be limited in accordance with SANS 215 or EN55015, in order that these products are safe for humans and do not cause interference with any other electronic device or system. Certified evidence that these products are EMI compliant with the above-mentioned standards, shall be provided. These requirements shall also apply to all other electrical and electronic equipment that produce electro-magnetic interference.

The use of incandescent or low voltage (12 V) halogen lamps will not be permitted.

The following lamp makes are approved for use in the installation:

PL compact fluorescent (CFL)	-	GE, OSRAM, PHILIPS or SYLVANIA
T5, 16 mm diameter fluorescent	-	GE, OSRAM, PHILIPS or SYLVANIA
HP gas discharge	-	GE, OSRAM, PHILIPS or SYLVANIA
LED lamps	-	CREE, GE, OSRAM, PHILIPS, SAMSUNG, VERBATIM-MITSUBISHI

Samples of all light fittings shall be provided for approval before ordering and installation. The approved samples shall be retained on site for the duration of the contract.

9 LIGHTING INSTALLATION

Light fittings shall be installed in the positions generally as shown on the drawings. The fittings shown on the drawings are only schematic and not necessarily drawn to scale.

The Contractor shall where necessary make allowance for additional fixing members, such as timber battens in suspended ceilings, in order to provide for the number of light points called for in this specification or indicated on the drawings.

As a minimum, all light fittings surface mounted against standard round conduit boxes shall be fixed with at least two (2) non-corrosive screws such as brass or stainless steel.

All light fittings recessed in suspended ceilings with removable tiles shall be connected by means of flexible cable, plug and socket arrangement. The flexible cable shall be a minimum of 1.5 mm^2 PVC insulated and shall not exceed 3 m in length. Unswitched 16 A, 3-pin socket outlets shall be used in conjunction with 20 A CB's and 5 or 6 A socket outlets with 10 A CB's.

Sockets installed within ceilings voids beneath reinforced concrete slabs shall be securely fixed against ceiling slab or suspended trunking and shall be accessible from below the ceiling. In situations like in roof structures or in ceilings where the voids are excessive, the socket outlets shall be fixed to rigid roof structure members or to a rigid wireway system to the approval of the Engineer.

The Contractor shall maintain close liaison with the ceiling specialist when installing recessed fittings.

Fittings mounted against suspended board ceilings shall, in addition to being fixed to the conduit outlet box, be fixed at two points using 50 mm, No.10 round head brass screws and oversize washers. Fittings mounted against concrete or brick surfaces shall be fixed with at least two No 8 plastic anchors and 50 mm, No 10 round head screws and oversize washers. Fender washers shall be used when fixing fluorescent fittings. Fittings may only be fixed direct onto conduit boxes if additional fixings are provided.

Fittings mounted against steel trunking shall be fixed with "P2540" hollow brass adapters. Fittings mounted against steelworks shall be fixed with approved galvanised steel brackets. Drilling of steelworks for fixing purposes may only be done with the approval of the Structural Engineer.

Fluorescent fittings suspended from suspended ceilings in occupied areas shall be mounted by means of 16 mm diameter steel droppers with ceiling cups, all having a white finish. Fluorescent fittings suspended from the ceiling in un-occupied areas shall be mounted with 20 mm dia. HDGS conduit.

High-bay fittings suspended from roof trusses shall be fixed by means of galvanised steel chain having links of not less than 5 mm diameter. Each fitting shall be suspended with two (2) separate steel chains utilising "CADDY" clips or other approved fixing devices.

The connection to surface mounted IP rated light fittings wired via concealed conduit shall be carried out via tightly fitting wiring rubber grommets. Suspended IP rated light fittings shall be carried out with approved compression glands.

Outdoor mounted fittings exposed to the weather shall suitably sealed to prevent ingress of moisture into the fittings or conduit boxes. The wiring into IP65 light fittings shall be done with cable and suitable compression glands or PVC wires through tightly fitting rubber grommets, in such a manner that the IP rating is not compromised.

The connection to outdoor floodlights or equipment using a similar connection shall be carried out with uv-resistant neoprene cable of suitable cross-section and approved outer sheath colour. An appropriately sized IP66 "AKARI" polyester junction box with back-plate and DIN-type connectors shall be provided.

Mounting brackets shall be HDGS and shall be approved before manufacture and installation, including sketch drawings for reviewing purposes. A sample installation of each type of bracket shall be provided and installed in situ for approval.

All vertically mounted light fittings designed for universal mounting, shall be mounted so that the lamp holder is mounted in the position recommended by the lamp Manufacturer.

Where called for, the following factors for light fitting and room dirt depreciation, lamp lumen depreciation and surface reflectances shall be used in lighting computations to arrive at the specified maintained lighting levels:

Lamp lumen depreciation factors:

CFL lamps	-	0.8
T5 16 mm Ra80 linear fluorescent	-	0.9
Metal halide	-	0.8
High pressure sodium	-	0.9
LED	-	0.9

Dirt depreciation factors:

Indoor air-conditioned areas	-	0.95
Indoor non-air-conditioned areas	-	0.9
Exposed indoor covered areas	-	0.85
Outdoor areas (normal clean areas)	-	0.8

Surface reflectance factors:

Floors, general areas	-	0.2
Floors, plant room/process areas	-	0.1
Windows and glazed areas	-	0.1
Walls, general areas	-	0.5
Walls, plant room/process areas	-	0.3
Roof structures	-	0.3
Ceilings, general areas	-	0.7
Ceilings, plant rooms/process areas with moderate obstructions	-	0.5
Ceilings, plant rooms/process areas with considerable obstructions	-	0.3

10 SOCKET OUTLETS

All single-phase socket outlets shall comply with SANS 164 and shall be rated at 16 A, 250 V and be installed in 100 x 100 x 50 mm flush galvanised steel boxes with white metal cover plates as manufactured by "CRAB-TREE" or similar and approved. Socket outlets shall, unless otherwise specified, be of the switched type (SSO).

All cover plates shall be steel with paint finish as specified.

The top of SSO's and other telephone or TV outlet boxes located in close proximity to each other shall line-up.

SSO's mounted in outdoor areas shall be enclosed suitable IP65 polyester enclosures with hinged covers

Circuit identification labels shall be provided on all electrical accessories (isolators, socket outlets and switches) cover plates. The label shall be permanently fixed and shall indicate the DB from which it is fed and the circuit number i.e. DB-AE/P1 – plug circuit P1 fed from DB-AE.

11 ISOLATORS AND ACCESSORIES

The rating of isolators shall be greater than the rating of the circuit breaker protecting a specific circuit.

All general-purpose sub-circuit isolators in indoor areas shall, unless otherwise specified, be of the "NWI" type enclosed in "ABB" boxes or of the "CRABTREE" type enclosed in flush or surface 100 x 100 mm metal boxes.

Isolators mounted in outdoor areas shall be of the IP65 pad-lockable polyester enclosure type. All cover plates for metal outlet boxes shall be steel with paint finish as specified.

Isolators for stoves or other similar fixed appliances shall be flush mounted and linked to a round conduit outlet box directly below at 300 mm above finished floor level for the final connection. Stove isolators shall be rated at 45 A, DP with neon indicator light enclosed in flush.100x100x50 mm metal boxes.

Isolators for geysers and other special purpose points shall be wired in solid conduit and where necessary ended off with 'Kopex' flexible conduit.

Labels shall be provided on the inside of all cover plates as per item (B1.7) of this section of the specification.

Circuit identification labels shall be provided on all electrical accessories (isolators, socket outlets and switches) cover plates. The label shall be permanently fixed and shall indicate the DB from which it is fed and the circuit number i.e. DB-AE/P1 – plug circuit P1 fed from DB-AE.

12 APPLIANCES AND ACCESSORIES

Electric chime bells for indoor use shall be of the 'Ding Dong' type.

Low voltage magnetic door locks shall be supplied and installed by others. The Contractor shall be required to provide the necessary control switches in indicated positions and shall undertake the necessary interconnections.

13 FIXING DEVICES AND LABELLING

Fixing equipment and materials shall be selected and engineered to suit the climatic and environmental conditions found on site. Wherever possible, special precautions shall be taken to avoid contact between dissimilar metals in order to prevent corrosion. Stainless steel fixings in aluminium housings shall be by means of special stainless steel 'Heli-coil' inserts to prevent corrosion and the screw from being fastened to the housing. Contact between aluminium and concrete surfaces shall also be avoided.

Light weight equipment mounted against walls or concrete ceilings may be installed with suitable wall plugs to the approval of the Engineer. Holes in joints between brick walls will not be permitted. The depth of the hole shall be equal to the length of the plug plus the thickness of the plaster.

Mounting of equipment against wood shall be done by means of appropriately sized greased screws and against board ceilings inaccessible from the back with toggle screws.

All heavy weight equipment shall be fixed to brick or concrete by means of expansion bolts. All exposed parts of the bolts shall be painted to have the same colour finish as the equipment. All expansion bolts used outdoors shall be hot dip galvanised or stainless steel. Electro-plated galvanised expansion bolts will not be permitted outdoors.

All mounting brackets for outdoor use shall be hot dip galvanised steel after manufacture. All fixings used outdoors shall be hot dip galvanised, stainless steel or brass as appropriate. No electro-plated galvanised steel fixings shall be used outdoors.

The Contractor shall adequately label all switches, socket outlets, isolators, telephone and TV outlet boxes and all junction / terminal boxes using engraved plastic sandwich type labels fixed by means of epoxy adhesive. The circuit reference numbers indicated on the layout drawings shall be used on the labels.

14 MOUNTING HEIGHT OF EQUIPMENT

Unless otherwise specified or indicated on the drawings, the mounting height shall be measured from the top of the equipment above finished floor level, as follows: -

	COMMERCIAL / INDUSTRIAL	RESIDENTIAL
Light switches	1400	1400
SSO's generally	300	300
SSO's in kitchens and food prep. areas	1200	1200
Stove Isolator	1200	1200
Stove outlet	300	300
Door bells	2200	2200
Telephone outlets	300	300
TV outlets	300	300
Light fittings, decorative wall mounted	2100	2100
DB's flush or surface mounted	2100	2100

Mounting heights which will be indicated on drawings will be shown adjacent to the respective equipment e.g. 1500 will indicate 1500 mm above finished floor level or finished ground level as appropriate.

15 ROUTES FOR ANCILLARY SERVICES

Where specified, the Contractor shall provide all indicated conduit, trunking, terminal/junction boxes and outlets required for the telephone, TV and other electronic services, and shall install non-rust heavy duty galvanised draw wires therein and close off all outlets with approved blank cover plates.

Outlet boxes for telephone, data and TV systems shall be flush 100 x 100 x 50 mm steel boxes with blank white steel cover plates. The telephone outlet boxes shall be linked to the terminal/junction boxes with 25 mm PVC conduit.

Indoor terminal/junction boxes shall be 150 mm deep flush mounted architrave type with removable covers, all made from pre-galvanised steel with an epoxy paint finish and shall be fitted with solid softwood timber backings. Outdoor terminal/junction boxes shall be surface or flush reinforced glass fibre "ABB" type as specified or as indicated on the drawings.

Unless otherwise specified, The Contractor shall allow for the installation of a 100 mm diameter PVC sleeve from the main telephone termination box/distribution board to an entry point at the site boundary as agreed with Telkom.

All other internal interlinks between telephone terminal/junction boxes shall be undertaken with 32mm conduit, unless otherwise specified.

Where specified, terminal boxes for the TV aerial system shall be flush mounted, weatherproof and corrosion resistant type with hinged padlockable doors fitted with hasp and staples. These boxes shall house a single phase SSO for the TV system. A 25 mm conduit shall be led to the highest point in the building and terminating in a swan-neck bend, to carry the TV aerial cable.

Wherever external services such as telephone, TV, etc. enter various buildings, transitions shall be accomplished by means of suitable corrosion resistant weather draw boxes, unobtrusively mounted at approximately 500 mm AFGL.

Heavy duty non-rust galvanised draw wire shall be installed in all sleeves and conduit required for the telephone and TV services.

The complete telephone network routes shall be to the approval of the Telkom Authorities and any modifications requested by them shall be carried out timeously.

16 EARTHING

The Contractor shall effectively earth the complete electrical installation in accordance with SANS 10142-1 as amended and with the requirements of the Supply Authority, before testing and commissioning of the installation.

The type of main earthing must be as required by the Supply Authority, and in any event as directed by the Engineer, who may require additional earthing to meet test standards.

The earthing of distribution boards and kiosks shall be obtained by installing the necessary number of approved vertical earth electrodes and 70 mm² earth wire. The electrodes as well as any other earth conductors must be connected in parallel with the 70 mm² copper conductor as main earth so that the earth resistance of the common earth is less than 2 ohms.

Where required an earth mat shall be provided. The minimum size, unless otherwise specified, being 1,0 m x 1,0 m and consisting of 4 mm diameter hard-drawn bare copper wires at 250 mm centres, brazed at all intersections. Alternatively, or additionally, earth rods or trench earths may be required as specified by the Engineer.

Connection from the main earth bar on the main distribution board must be made to the cold water main, the incoming service earth conductor, if any and the earth mat or other local electrode by means of 12 mm x 1,60 mm solid or perforated copper strapping or 16 mm² stranded bare copper wire or such conductor as the Engineer may direct. Main earth copper strapping where installed below 3 m from ground level, must be run in 20 mm diameter conduit securely fixed to walls.

All other hot and cold-water pipes shall be bonded with 12 mm x 1,6 mm solid or perforated copper strapping to the nearest switchboard. The strapping shall be fixed to the pipework with brass nuts and bolts with round brass screws. In cases where metal water pipes, down pipes, flues, etc., are positioned within 1,6 m of switchboards an earth connection consisting of copper strapping shall be installed between the pipe work and the board. In vertical buildings ducts accommodating both metal water pipes and electrical cables, all pipes shall be earthed at each distribution board.

Corrugated iron roofs and guttering must be effectively earthed with copper tape and brass bolts and nuts at intervals not exceeding 18 m. Self-tapping screws are not acceptable as a means of securing earth conductors.

A separate earth connection shall be provided between the earth busbar in each sub-distribution board and the earth bar in the main switchboard. These connections shall consist of bare or PVC insulated copper earth

wire installed along the same routes as the supply cables or in the same conduit or sleeve as the supply cable or conductors. Alternatively, armoured PVCA cables with earth continuity conductors (ECC type) included in the armouring may be utilised where specified or approved.

All earth conductors of all sub-circuits shall be connected to the earth busbar in the relevant supply board in accordance with SANS 10142-1.

Common earth conductors may be used where various circuits are installed in the same wire way in accordance with SANS 10142-1. In such instances the size of the earth conductors shall be equivalent to that of the largest current carrying conductor installed in the wire way, alternatively the size of the wire shall be as directed by the Engineer.

Earth conductors for individual circuits branching from the ring main shall be connected to the common earth conductor with T-ferrules or soldered. The common earth shall not be broken. Where the earth conductor is joined at a terminal block, the wires shall be soldered together so that removal of the equipment shall not result in an interruption of the earth continuity of the conductor.

PVC insulated earth conductors shall be installed in all conduit and fixed securely to all metal appliances and equipment, including metal switch boxes, socket outlets boxes, draw boxes, switchboards and luminaries, etc. The securing of earth wires by means of self-threading screws will not be permitted.

With flexible conduit the earth wire shall not be installed externally but within the conduit together with the other conductors. The earth wire shall be connected to the earth terminals at both ends of the conduit.

Under no circumstances shall any connection points, bolts, screws etc., be used for earthing be utilised for any other purpose. It will be the responsibility of the Contractor to supply and fit earth terminals or clamps on equipment and materials that must be earthed where these are not provided. The copper strands of an ECC type cable shall be terminated in a suitable lug and bolted to the earth bar.

Unless earth conductors are connected to proper terminals, the ends shall be tinned and lugged.

17 LIGHTNING PROTECTION

The lightning protection installation shall be carried out in accordance with SANS IEC 62305:2011 or latest amendment (Protection against lightning) and SANS 10313:2012 or latest amendment (Protection against lightning – Physical damage to structures and life hazard) Where specified, the lightning protection installation shall be carried out by a specialist Sub-Contractor.

The Contractor shall submit a complete set of layout drawings showing the complete installation to the Engineer for reviewing before commencing with the installation work.

The installation shall consist of finials, air terminals, down conductors, test joints and earth electrodes as required.

Where drawings are produced by the Engineer, the installation shall be strictly followed as per the design.

Finials shall be installed on the roof as required and the length of each finial must be at least 500 mm.

All air terminals shall consist of 10 mm diameter aluminium conductors fixed on to the walls by means of aluminium saddles on thermo plastic seatings. The connections between the air terminals on the various roof levels and the aluminium conductors on the walls shall consist of 10mm diameter solid aluminium conductors. Down conductors from the roof shall consist of green insulated stranded copper earth wire installed on 25 diameter conduit that is chased or built-in the structure. The stranded copper down conductor shall not be less than 50 mm².

The termination of the down conductors and bonding tails to the roof sheeting shall be done by means of lugs and brass screws, nuts and washers. All terminations on the roof sheeting shall be sealed with a suitable uv-resistant water-proof compound to the approval of the Engineer.

Test joints shall consist of flush 100 x 100 x 50mm deep draw boxes. The connection between the down conductor and the earth wire from the earth electrode in the box shall be made with a suitable brass bolt and nut. Each earth electrode termination shall consist of a length of 50 mm² green PVC insulated stranded copper wire connected to the disconnecting bolt in the test joint box at one end and to the earth electrode at the other end.

The earth electrodes shall comprise "Cadweld" solid 16 mm diameter, 1.5 or 2.0 m long copper welded type with a minimum copper coating of 200 microns to SANS 0163. Inferior grade earth rods will not be acceptable. The earth electrodes must be driven into the ground to at least 500 mm below finished ground level and only after the final bonding and tests have been carried out must proper back-filling and compacting of same take place. The use of charcoal is not permitted. Earth electrodes used to bond down conductors shall be installed at least 1m from the building perimeter and shall clear all aprons and channels. BCEW and earth electrodes shall be bonded by means of the Exothermic method.

Earth resistance tests shall be carried out as soon as possible after the rods have been connected and shall not exceed 10 ohm (7 ohm preferred) . Tests shall be carried out under normal dry ground conditions.

The installation shall be tested in accordance with SANS IEC 61024 and a test certificate of the results shall

be submitted to the Engineer.

18 TESTING, INSPECTION AND COMMISSIONING

The Contractor shall test the complete electrical installation in accordance with SANS 10142-1 as amended and with the requirements of the Supply Authority, before final commissioning and handing over of the complete installation.

Tests shall be carried out on all equipment at the place of manufacture and /or after installation on site.

The Engineer reserves the right to witness all tests. The Contractor shall therefore notify the Engineer at least seven (7) days in advance of when he intends testing the installation. During these tests the Contractor will be required to prove the efficiency of the installation to the Engineer.

Prior to carrying out acceptance tests, the Contractor shall operate the entire installation for as long a period as may be required for the satisfactory performance of the installation.

The Contractor shall provide all the necessary instruments for the proper testing of the complete installation. If there is reason to doubt the accuracy of such instruments, the Contractor shall take the necessary action to prove their accuracy.

All single-phase socket outlets shall be tested for polarity and sensitivity of the earth leakage protection equipment and shall be tested by means of an approved instrument.

Each length of cable shall be tested for insulation and polarity by means of a 1000 V megger. In the case of underground cables this shall be done before backfilling. In addition, the earth-loop impedance of each main and sub-main feed shall be measured. "DANGER" notices shall be displayed at remote ends of cables under test.

The earth resistance of each down conductor earth electrode shall be measured by means of an approved instrument.

All safety features on equipment and plant and protective devices shall be individually set to suit operating conditions of the works.

All tests shall be properly recorded and copies of the test results as well the Certificate of Compliance shall be submitted to the Engineer prior to the final inspection and handing over of the complete works. Operating records shall be kept once the installation has been commissioned and this shall continue until the acceptance tests have been carried out and the installation handed over.

The Contractor shall ensure that the installation is complete and commissioned in every respect and that there are no major defects prior to notifying the Engineer (in writing) for a final inspection. During the course of the inspection, the Engineer will compile a list of any items requiring further attention. A copy of this list will be provided to the Contractor who will have a period of 7 days in which to rectify the unacceptable items. During the final inspection, the Contractor may be required to carry out random tests on the electrical installation, as directed by the Engineer, and shall therefore provide all the necessary test equipment for this purpose.

The Engineer will accept no major defects and only a limited number of defects during the first delivery or practical completion inspection. Should there be any major defects or an excessive number of minor defects at the first inspection, then the Engineer will terminate that inspection and requests that an additional first delivery inspection be arranged by the Contractor.

The Contractor shall note that the complete works cannot be taken over and occupied until the Certificate of Compliance has been submitted and accepted by the Engineer.

The Contractor shall balance the loads across all three-phase switchboards as evenly as possible during commissioning of the installation. Where conductors are altered to achieve satisfactory results, they shall be re-taped by the Contractor.

On completion of all tests and commissioning of the works, the Contractor shall prepare a complete test report and performance check list which shall be endorsed to the effect that the installation meets with the requirements of the electrical specification and drawings. These, together with guarantees of equipment and all Certificates of Compliance, shall be submitted to the Engineer for reviewing and shall then be inserted in the maintenance manual.

The Contractor shall submit one complete set of marked-up "as-Built" record drawings of the whole electrical installation to the approval of the Engineer. These drawings shall show details and positions of all services actually installed in the works. All cables joints, markers, cable sleeves, etc., must be accurately dimensioned on the drawings.

An "As-built" drawing transparency of the main electrical reticulation network of the overall installation shall be suitably framed to the approval of the Engineer and shall be mounted in the main electrical switchroom.

Retention moneys normally due at the start of the maintenance period will not be released until "As-built" drawings have been prepared to the satisfaction of the Engineer.

19 OPERATING AND MAINTENANCE MANUALS

The contractor shall provide FOUR (4) hard and soft copies of the maintenance manual to the approval of the Engineer.

The final completion certificate will not be issued until the copies of the approved maintenance manual have been issued to the Engineer.

The Contractor must ensure that he provides marked-up 'as-built' record drawings timeously to the Engineer so that final 'as-built' record drawings for inserting in the manuals can be prepared.

The maintenance manuals shall comprise of a suitably labelled plastic covered 'Bantex' lever arch files with pre-labelled plastic dividers.

The manual shall be made up of the following sections and sub-sections:

1. Introduction:
 - Scope of Manual;
 - General Arrangement of Manual;
 - Description of Installation;
 - Standards; and
 - List of design and construction firms.
2. List of Drawings:
3. Specifications:
 - Detailed Electrical Specification;
 - General Electrical Specification; and
 - Any other specification such as for painting, etc.
4. Operating Procedures:
 - Switching methodology of lighting installation; and
 - Other equipment such as ventilation / extract fans, pool pumps etc.
5. Maintenance:
 - Purpose of maintenance;
 - Preventative maintenance schedule with monthly and yearly activities; and
 - Breakdown maintenance.

This section shall also include a complete maintenance spare parts list of major equipment.

6. Parts and Components:
 - Switchgear and control equipment;
 - Cables;
 - Lighting equipment;
 - Ventilation equipment;
 - Any other relevant equipment; and
 - Supplier details.

This section shall also contain a schedule containing particulars and part numbers of all major components e.g. light fittings, switchgear, electrical accessories, etc. to facilitate the ordering of spares.

7. Appendices:
 - Compliance Certificates for each DB or building;
 - Electrical installation test certificate.
 - Earthing test certificates;
 - Equipment guarantees;
 - Completion Certificate; and
 - Final 'As-Built' record drawings.

Notes:

- a) The completion certificate and the final 'As-built' record drawings for inserting in the maintenance manual will be provided by the Engineer.
- b) Copies of equipment brochures shall be inserted after the relevant sub-sections.

20 COMPLETION AND MAINTENANCE DURING THE GUARANTEE PERIOD

Tenderers shall give a 12 month guarantee to replace free of charge, any part of the installation in which any manufacturing defects or defects due to poor workmanship may develop within that period. Such period will commence from the date of issue of the Completion Certificate.

Practical completion shall occur when the installation has been completed with the exception of a few outstanding minor items, which must be attended to within a reasonable period of time. Practical completion may also only occur after the installation has been fully tested and is fully compliant with the relevant Codes and Regulations. Occupation of the works after practical completion may only occur after the relevant Certificates

of Compliance have been issued to and reviewed by the Engineer.

Completion shall occur when all defects indicated on the Practical Completion Certificate have been successfully attended to, to the satisfaction of the Engineer.

The 12-month maintenance period shall commence from the date when the completion certificate has been issued by the Engineer. Final completion shall occur at the end of the 12-month maintenance period.

During the guarantee period the Contractor shall be fully responsible for the complete maintenance of the installation, which shall include materials equipment and labour. Maintenance of the installation shall mean the regular servicing, repairing cleaning and adjustments of the installation as well as free of charge replacement of any defective components during the guarantee period.

A fully qualified and trained person shall examine and test the installation when a fault occurs and shall also perform all the necessary maintenance tasks to ensure smooth and faultless operation. All emergency calls shall immediately be attended to by the Contractor.

A notebook shall be kept on site and all details of each visit and of the servicing and repairs carried out shall be recorded. Each entry shall be dated and signed by the Contractor as well as the delegated representative of the Client or owner or occupier of the premises. The book shall at all times be kept in a safe place on site and shall be made available to the Engineer for inspection as and when requested. Failure to record all details of servicing and repairs carried out, in this book, may result in the guarantee period being extended.

21 SCHEDULE OF MANUFACTURES OR SUPPLIERS

Tenderers may offer alternatives for specific makes of equipment and materials, unless otherwise specified, as follows, however the project specification requirements shall take precedence.

- a) Tenderers wishing to offer alternative makes of materials and equipment to those specified below or elsewhere in the Specification, may qualify their tenders with a covering letter, stating the difference in price to their tender between the specific item and the alternative offered.
- b) The successful Tenderer who wishes to supply any alternative makes must obtain prior approval in writing from the Engineer.
- c) Tenderers shall ensure to use makes that are available and serviced by a reputable long-standing local firm that is located within close proximity to the site of Works.

ITEM MAKE OR MANUFACTURER REMARKS:

Distribution Boards : Pitt Switchboards, Mvelo, Electroboards, Siemens, Switchboard Manufacturers, SA-BELCO. Refer to Clause B1.4 of the Standard Technical Specification

ACB's (Metal-clad Air Circuit Breakers) : ABB, AEG, Mitsubishi, Schneider. Rupturing capacities shall be as indicated in the Schedule of Equipment for the distribution boards

ACB's (Moulded case and/or Miniature Circuit Breakers) : ABB, Siemens, CBI, Schneider, Mitsubishi. Minimum fault level rating – 5 kA (SANS) unless otherwise specified.

Isolators : ABB AEG Siemens CBI, Schneider, Mitsubishi, Santon, Socomec. On load type. Rotating contacts not acceptable.

Fuse Switches, Isolators CFS Units : ABB, AEG, EE, Elsta, Siemens, Socomec, Stromberg, Watford Schneider

Selector Switches Control Circuits : Kraus & Naimer, Santon, Telux, AEG, Lovato, Schneider

3-phase + neutral + off for voltmeter switches. Off position between each "On" position for all other switches

Control Switches Limit Switches Indication Devices: ABB, Eaton, Electro, Lovato, Omron, Schneider

Panel mounted Contactors and Starters : ABB, CHI, Eaton, AEG, Siemens, Schneider, Lovato. Contactors to have 230 V continuous operating coil unless otherwise specified

Control Relays : AEG, ABB, Electromatic, Finder, Omron, Phoenix, Schneider. Plug-in type with minimum of one spare set of contacts

Panel Accessories: Ventilation Fans Ventilation Grills Hinges Closures : Electro, Barker & Nelson, Perano

Lighting Switches and Switched Sockets (standard SANS flush mounted type) ; Crabtree , Clipsal, Le Grand With steel cover plate. (Colour, satin, nickel) with silver anodised aluminium coverplate. With polycarbonate coverplate. White switches. Brown switches. Black switches.

- do - (surface mounted) : Crabtree ,Clipsal. Surface industrial type

- do - (on powerskirting) : Crabtree, Clipsal, Le Grand . Standard cover plates are not required. White switches. Brown switches. Black switches

Switched Socket Outlets : CEE, Norm, Scame, Gewiss IEC 309 type

Maximum Demand kWh Meters : Sangamo, Enermax, Landis & Gyr

Ammeters : ATW, Elima, Frapil 96 x 96 mm with 100 % overscale. Above 60 A, 5A CT operated
 Voltmeter : ATW, Elima, Frapil 96 x 96 mm. 500 V scale for 400V system
 MD Ammeters : ATW, Elima 96 x 96 mm. 5 A CT operated with built-in saturation CT
 Current Transformers : ATW, Elima, Frapil, ABB, Harper, Sema Class CM
 Digital Network Analysers : ABB, Lovato, Schneider Flush 96 x 96 mm in panel
 Power Factor Correction Capacitors : Alpes, Schneider
 Lightning Surge Arresters : DEHN, Phoenix Class 0,1 and 2
 Time Switches : Elima, Flash, Horstman, Landis & Gyr, Venner, Schneider, Omrom, Quartz movement with 12-hour spring reserve with on/off auto selector
 Thermostats : Honeywell, Satchwell Room temperature range
 Powerskirting : Legrand, Cabstrut. Refer to Clause 6.4 above
 Shave Plugs : Clipsal, Crabtree
 Floor Channel : Cabstrut. Refer to Clause 6.5 above
 Enclosures : ABB, Sarel
 Dimmers : Helvar, Safronic, Strand, Dyalite
 Terminal Blocks : ABB, Klippon, Phoenix, Weidmuller
 Lamp Ballast : Osram, Philips, Tridonic
 Lamps : GE, Osram, Philips, CREE, Samsung, Verbatim-Mitsubishi
 Underfloor Heating : EHC, Prism Sales, Clipsal
 Cable Glands : CCG, Systems, Pratley. To SANS 1213 – Common type to be used throughout the installation
 Programmable Logic Controllers (PLC's) : DELTA, ABB, AEG, Alan Bradley, CHI, Eaton, Mitsubishi, Schneider, Siemens. Use make that is available and serviced by a reputable long- standing local firm/s, that is within close proximity to the site of the Works.
 Uninterruptible Power Supply (UPS) : Meissner, Schneider, Square One, Power Solutions, EATON. Use make that is available and serviced by a reputable long- standing local firm, which is in close proximity to the site of the Works.
 Soft Starters : ABB, Alan, Bradley, CHI, Schneider, Siemens, Yaskawa. NB. Soft starters to incorporate harmonic filtering to suit the specific motor being controlled.
 Variable Frequency Starters / Variable Speed Drives (VSD's) : Control Technologies, ABB, Alan Bradley, CHI, Schneider, Siemens, Yaskawa. NB. VSD's to incorporate harmonic filtering to suit the specific motor being controlled.
 Solar Power PV Panels : Solar World, Schuco. PV panels shall have a 25-year performance guarantee
 Solar Power Inverters : SMA Outback. The inverter shall have a minimum 10-year guarantee
 Solar Batteries : Hoppecke. Deep cycle type with ≥ 2300 cycles at 50% depth of discharge.

22 LOW VOLTAGE ELECTRIC MOTORS

22.1 General

The motors required are described in detail in the Mechanical or Electrical Specification where applicable. Motors offered shall to be controlled from a frequency inverter, soft starters, DOL starters or star-delta starters where specified, and shall be designed run on a supply from where the output will be 50Hz, and the rotor shall be balanced accordingly.

NB Any dimensions or arrangements given are approximate and the successful Tenderer will be deemed to have visited the site and checked the dimensions before proceeding with any work. Tenderers are required to price for a new, fabricated motor baseplate and coupling.

Motors offered by Contractors shall be accepted provided the units have a minimum of servicing requirements including greasing intervals.

Contractors shall be responsible for the alignment of the motor and pump units.

22.2 Rating

All electric motors shall be rated for operation on a 3 phase, 4 wire, 400/230 Volt, 50 Hz, AC supply at sea level, with an ambient temperature of up to 40 °C.

The rated power of the motor shall be selected to be not less than 15 % in excess of the designed power requirement of the associated plant or pump, unless the motor forms part of a packaged unit and/or where the size of the motor is specified and/or as otherwise approved by the Engineer.

A motor shall be selected so that it shall reach full operating speed within 10 seconds for the method of starting and drive arrangement used.

22.3 Specifications

Except as otherwise specified, motors shall be standard squirrel cage or slip ring motors complying with SANS 1804 as amended, with IP68 enclosure and IC 0141 cooling, and suitable for a damp environment. Motors shall be suitable for both "continuous running duty", Duty Class S1, and "intermittent periodic duty", Duty Class S3.

Windings shall be copper conductors insulated with Class F material (100 °C rise capability) with Class B temperature rise (80 °C). The motors shall be suitable for 6 starts per hour, two of which shall be consecutive.

22.4 Type

The type of motor (and starter if applicable) which is to be supplied is determined by the requirements of the application specified in the Detailed Mechanical Specification and by the starting limitations specified in the Electrical Specification. In the absence of such specifications, a standard squirrel cage motor complying with this Clause shall be offered.

22.5 Construction

Motor frames shall be of the totally enclosed fan cooled type with cast iron yoke frames and cast-iron end covers. Sheet steel is not acceptable for fan cowls and these shall be of cast iron, tough plastic or stainless steel. The end covers and yoke shall be properly machined and each cover shall locate on a spigotted register to ensure concentricity and parallelism. Bearings shall be of grease lubricated roller and/or ball type, provided with grease nipples (with extension tubes where access is restricted) and sealed to suit external use. Motors required for external use shall be fully weatherproofed and IP rated.

22.6 Terminal Boxes

Terminal boxes shall be top mounted wherever possible and arranged for cable entry from either side. The two ends of each stator winding shall be "brought out" to the terminal box. Squirrel cage motors shall be wired to permit both direct on-line and star delta starting.

22.7 Thermistors

Motors rated at 15 kW and up to (but not including) 400 kW or similar rating, as well as motors for variable speed drives shall be provided with thermistors embedded in the windings of each phase. The thermistor tails shall be "brought out" to separate terminals mounted near the motor winding terminal block. Refer to the Project Specification for the final thermistor requirements.

22.8 RTDs

Motors rated at 15 kW and above, both fixed and variable speed, shall be provided with PT 100 type RTDs. Two RTDs shall be provided per phase winding. All six shall be incorporated into the control system; three to provide monitoring and three to provide high temperature trip functions. Refer to the Project Specification for the final RTD requirements.

22.9 Heaters

Motors of size 7,5 kW and above shall be fitted with "pocket" heaters. The heater shall be mounted at the bottom of the motor frame and shall be replaceable without dismantling the motor. These shall be arranged to switch on when the motor stops operating and switch off when it starts operating. Refer to the Project Specification for the final motor heater requirements.

22.10 Slip Ring Motors

Slip ring (wound rotor) motors shall be of the totally enclosed fan cooled type with stainless steel slip rings. The slip rings shall be mounted inboard of the non-drive end bearing and shall be fitted and keyed to the shaft as a single unit. The terminal box shall be common to both stator and rotor connections.

The brush holders shall be manufactured from fibreglass and shall be removable from the terminal box as a complete unit. Where the current density in a single brush at the full operating load approaches or is above 80 % of the capability of the brush, then an additional brush shall be provided in a separate brush box.

22.11 Motor Speed

Motor speeds shall be preferably selected as follows:

- a) Motors with ratings below 30 kW can have nominal speeds up to 3 000 rpm.
- b) Preference shall be given to motors with nominal speeds up to 1 500 rpm for ratings between 30 kW and 132 kW, both inclusive.
- c) Motors with ratings above 132 kW shall have a nominal speed of 1 500 rpm or below.

22.12 Variable Speed Application

In applications where the motor speed is controlled by variable frequency drive, the motors shall be cooled by a separate, 50 Hz motor driven "piggy back" fan. This requirement will be waived if the Contractor can provide documentation to confirm that the drive and motor design can operate in the application, with shaft mounted fan, without overheating. This requirement does not apply to submerged motor applications.

22.13 Hazardous Locations

When required to suit a hazardous location in terms of SANS 10108 or in terms of this Specification, suitable motors complying with SANS 60034 5 or SANS 61241, as appropriate, shall be supplied. The relevant SANS certificates, clearly indicating the location classification in which the machine may be operated, shall be submitted to the Engineer before delivery of the motors. Each motor shall be clearly and permanently marked with the applicable certificate number.

22.14 Special Motors

Should the Tenderer wish to offer a different type of motor to those specified so as to obtain special starting characteristics and/or variable speed, a full technical specification of the motor must be supplied and such

specification shall be for equipment to a standard at least equal to that of the motors specified above. In particular, no item of electrical protection shall be omitted.

22.15 Environment Warning

Motor manufacturers are advised that the motor is to be installed in a corrosive and often damp environment. The motor shall therefore be adequately protected and IP rated.

PARTICULAR PROJECT SPECIFICATIONS FOR 11kV MV MINI-SUBSTATION & SWITCHGEAR

A. SCOPE OR WORK :

The scope for the 11kV work is as follows :

- Make application to Eskom to increase the power supply to the WWTW site to 630kVA
- Arrange for Eskom or UGU Municipality Electricity Department to isolate and disconnect the existing 11KV power supply to the existing 500kVA transformer and switchgear.
- Make safe, disconnect and remove the existing transformer and switchgear
- Deliver all the redundant 11kV transformer and switchgear with all associated equipment and cables to the UGU stores
- Supply and install a new 630kVA 11/0,4kV mini-sub per the specifications below
- Disconnect and relocate the existing meter panel into a new room to be built. Pay all connection costs to Eskom for this work
- Provide GA and wiring diagrams of the mini-sub for comments and approval prior to manufacture
- Provide QCP documents for approval
- Conduct FAT for the min-sub
- Provide earthing for the mini-sub
- Arrange for the Eskom or UGU Municipality Electricity Department to re-instate and re-energize the existing power supply to the site and transformer once the change-over to the new mini-sub is completed.
- Testing and commissioning
- Training
- O & M manuals

The Miniature Substations will be outdoor type installed at the position (s) approved by the Engineer, or his representative.

PS 1.1 GENERAL

The following Specifications covers the manufacture / supply and installation of miniature substations suitable for use on 11kV (three phase) and 420 volt (three phase and neutral) 50 Hz systems. Miniature Substations shall be manufactured by ABB or Electronic Assemblies (or an Equally Approved manufacturer approved by the Electrical Engineer). Only miniature substations manufactured from **NEW** materials will be accepted. **Re-furbished transformers, ring-main units, or enclosures will NOT be accepted.**

The mini-sub is to be installed at the Margate Waste Water Treatment Works in Margate in the UGU District Municipality at an altitude of 55 to 65 m MSL with the atmosphere being corrosive with a high severity and therefore all materials are to be corrosion resistant. The mini-sub is to be installed on a slab above the ground flood level. This information shall be used in the design, rigging and installation of the mini-sub.

The mini-sub shall be similar to Electronic Assemblies or ABB type Unipack-G or similar and equal approved non walk-in compact type and incorporates the following compartments :

- Medium voltage compartment
- Transformer compartment
- Low voltage compartment

Housing:

The tenderer shall tender for outdoor weatherproof double layer self extinguishing GRP type (glass reinforced polyester) minisub enclosures to ASTM D635, the color shall be light stone color C37 of SABS 1091. The roof shall be able to be lifted off on site for replacement of equipment when needed. The manufacturer shall ensure that the unit can fit in the room or spaces provided with the roof lifted off. The final color shall be confirmed prior to manufacture of the unit.

The base frame shall be self supporting type made of hot dipped galvanized mild steel and shall be made to carry the complete equipment load. All internal parts are to be hot dipped galvanized. All fasteners, bolts , nuts , washers etc shall be stainless steel.

MV Cubicle: The MV housings shall have 3 doors on the MV side, one on the end and a trapdoor on front and back each lockable but accessible from the inside only.

LV Cubicle: 2 Doors in front of minisub and one access door to the main LV MCB on the side.

3CR12 Housings

PS1.1.1 Construction

Where specified only, all 3CR12 housings are to be manufactured from 2mm plate throughout.

PS1.1.2 Paint Specification

Where specified, all 3CR12 housings are to be cleared of all scratches and degreased thoroughly prior to painting. A Plascon AW255 2 pack epoxy primer shall be applied to the 3CR12 as an undercoat. After enough drying time, a final coat of Automotive 2K paint shall be applied – Light Stone color C37 of SABS 1091. GRP housings are to be cleared and painted to ABB, Electronic Assemblies or similar supplier's standard specifications.

Doors

Where specified only, all 3CR12 housings are to have 16mm round 316L Stainless Steel barrel hinges with 8mm 316L Stainless Steel hinge pins. 3CR12 housings will have aluminum anodized danger labels pop riveted to all entry doors.

GRP doors are to be cleared and painted to the suppliers standard specifications.

All locks will be heavy duty 3-point locking and have a bolted on lock protection cover. Dimensions of this cover shall be a minimum of 290mm long x 185mm wide with a depth of 100mm. Stainless steel nuts and bolts shall be used to fasten these covers to the doors for tensile strength purposes. The final locking arrangement shall suit the manufacturer's standard equipment.

Cooling shall be natural ventilation with each door shall having louvre air vents top and bottom backed by a stainless steel gauze to make the unit vermin proof and to provide adequate ventilation.

All doors shall have foam gasket of 10mm thick around the entire inside of the door surround to minimize dust and water penetration.

A rigid wind stay (suitable door stop or stoppers) shall be provided to secure each door in the open position at a minimum angle of 90°. The door held in the open position shall be capable of withstanding the wind pressure. It shall be possible to operate and maintain all equipment with doors in the open stayed position.

PS1.1.3 Designs, Drawings and QCPs

The mini-sub manufacturer shall be responsible to carry out the designs and produce the GA and wiring diagrams of the mini-sub and submit these to the Engineer and Client for approval prior to manufacture. Approval shall be obtained prior to manufacture of the unit/s.

Full QCP documentation (quality control documents) shall also be provided for the mini-sub and all associated equipment for approval prior to ordering of any equipment.

The mini-sub and all associated switchgear and equipment shall comply to the standards and requirements of the Engineer and Client.

PS 1.2 SPECIFICATIONS

The design, structure and installation of the mini-sub equipment and components shall comply to the following IEC standards :

- IEC 622271-202 : High voltage / low voltage refabricated substations
- IEC 62271-299 : AC metal-enclosed switchgear and control gear for rated voltages above 1 kV up to 52kV
- IEC 60076 : Power transformers
- IEC 61439-1 : Low voltage switchgear
- Eskom Standards for mini-sub and transformers

PS 1.3 REQUIREMENTS

PS 1.3.1 Plinth

The plinth shall be as per Electrical Engineer Specifications or to suite the supplier's standard specifications where it is required.

The plinth shall be supplied with the min-sub and be so designed to carry the full weight of the unit. Suitable penetrations, openings, slots, sleeves etc shall be provided in the plinth for the cable entries and exist from the mini-sub MV and LV compartments. These requirements shall suit the mini-sub to be supplied.

PS 1.3.2 Under-base

Steel under bases of minimum height 3375mm shall be supplied for the packaged substation. In addition to hot-dip galvanizing, the bases shall be coated with black epoxy tar paint.

PS 1.3.3 Labelling

All equipment shall be fully labelled and accurate description shall be given.

Engraved plastic shall be used for labels. The labels shall bear black lettering on a white background.

Printed or painted labels are not acceptable.

The following labels shall be supplied as a minimum requirement:

Designation of each circuit i.e. circuit breaker, isolator, meter etc. employing lettering at least 5mm high. One label to be installed directly above or below each item of equipment pertaining to the particular circuit shall be provided.

Danger labels, electricity signs, no un-authorized entry labels, name plate details and serial numbers shall be included. Labels shall be in English, Afrikaans and Zulu.

The mini-sub details are to be stenciled on the outside of the mini-sub. Alternatively an aluminum label shall be rivetted on the unit.

PS 1.4 MINIATURE SUBSTATIONS – MEDIUM VOLTAGE COMPARTMENT (11KV)

Ring Main Unit (RMU)

The Miniature substation shall include the supply and installation of MV SF6 Gas Insulated Switchgear and Fused Ring Main Unit (SafePlus) manufactured by ABB, Electronic Assemblies (or an Equally Approved Switch by the Electrical Engineer). The fuses and switchgear must be Gas Insulated, oil immersed or air insulated will NOT be accepted. The Ring Main Unit shall consist of one 630A Incoming Ring Isolator on the left-hand side, one fused 630A T-Off for supply to transformer and one 630A Outgoing Ring Isolator on the right-hand side. A spare 630A isolator shall be installed for a future ring feed.

The Ring Main Unit is to have Integral Test Facilities for both Rings. The mechanism shall provide a built-in interlocking system to prevent operation of the switch when the earthing switch is closed, 3 x XLPE single core insulated HV cable shall be installed between the ring main unit and transformer. The cables on the transformer shall be compounded and taped with Scotch 23 and finished using a polyvinyl Tape to protect the insulation from pollution. The cables on the ring main unit shall be terminated using BICC Compound covered by an anti-static Heatshrink tube.

The ring main unit shall comply to the following ratings :

- | | |
|---------------------------------|--------------------------|
| • Rated voltage | 11kV |
| • Impulse withstand voltage | 95kV (TBC by supplier) |
| • Rated frequency | 50 Hz |
| • Rated current busbars | 630A |
| • Rated current Isolating Rings | 630A |
| • Rated current Fused T-off | 630A (TBC by supplier) |

NB: ALL CABLE STRESSES SHALL BE CONTROLLED ELECTRICALLY AS WELL AS MECHANICALLYFuses and Insulating Oil (where specified and required) :

3 x Fuses shall be supplied with each miniature substation. The following fuses shall be supplied:

3x200A(800KVA) ABB or Bussmann HV OEFMA 254mm with Striker Pin or similar and equal approved. The fuse rating is to be confirmed by the supplier.

The correct amount of Insulating Oil (where specified and required) shall be supplied in a 210L AAA Drum and sealed. All insulating oil to be supplied with test certificate stating KV (Minimum 55KV) breakdown @ 2.5mm gap.

PS 1.4.1 Transformer Compartment

The transformer shall be IP35 to comply with SABS 780.

PS 1.4.2 Transformer Specifications

The transformer shall be 3 phase dry type , Vector Group: DYN 11.

Primary connections : Delta (Copper Windings - **Aluminum not accepted**)

Secondary connections : Star (Copper Windings - **Aluminum not accepted**)

Type of cooling: ONAN (Oil Natural Air Natural)

M.V. tapping: +- 2,5% In and +- 5% offload switch (pad lockable)

Transformer oil (where specified and required) : Only Virgin Insulating Oil. First filling to SABS 555

Transformer Lid: Welded

*Additional requirements: lifting lugs, rating and diagram plate, **WELDED** oil level indicator (where specified) including earthing terminal.*

PS 1.4.3 Transformer Corrosive Applicationa) Transformer Tank

The transformer tank shall be zinc metal sprayed and painted in accordance with SABS 780 for corrosive application. Transformers to have **porcelain bushings on HV and LV side.**

b) Radiator

All radiators are to be stainless steel or hot dip galvanized in accordance with the relevant requirements of SABS 763.

PS 1.4.4 Transformer Technical Information

- System Voltage (Primary Voltage) – 11KV
- System Voltage (Secondary Voltage) 420/242 Volt, at no load.
- Frequency 50hz
- Number of phases (Medium Voltage) Three
- Number of phases (Low Voltage) Three phase four wire
- KVA Rating 630KVA at 11KV (630 KVA Mini substation)
- Lightning – Severe (surge protection to be provided)

Average power factor – Above 0,8

The neutrals of the 420/242 Volt secondary of the transformer shall be earthed.

PS 1.5 MINIATURE SUBSTATION – LOW VOLTAGE COMPARTMENT (420V)**Rating of the Low Voltage Neutral Terminals (S.A.B.S. 780)**

The rating of the low voltage neutral terminal shall be the same as that of the line terminals.

PS 1.5.1 Internal Wiring

- a) The low voltage compartment shall be IP54 rated and designed to house the ABB, Electronic Assembly or similar approved low voltage circuit breakers m switch fuses and low voltage fuses

- b) The copper cable connections between the LV bushings and MV switchgear shall be suitable sized . Cable ratings and calculations shall be provided with the tender
- c) The connection between the LV bushing of the transformer and the LV main unit shall suitably sizes cables or busbars
- d) Standard 600/1000 Volt grade PVC insulated stranded annealed copper conductors to SABS 150 and SABS 780 shall be used for the internal wiring.
- e) All wiring shall be numbered in order to trace the wire.
- f) Wiring shall be installed away from exposed or sharp metal edges or shall be protected where crossing metal edges.
- g) Joints in the wiring will not be acceptable
- h) Where conductors change direction, smooth bends shall be formed.
- i) The low voltage measuring panel(s) shall be provided and located at the top of the panel to accommodate the low voltage measuring meters and equipment

PS 1.5.2 Conductor Terminations

All conductors terminating on equipment with screwed terminals shall be fitted with lugs. The lugs shall be crimped to the end of the conductor with the correct amount of insulation removed from the end to fit into the lug. Strands may not be cut from the end of the conductor.

All lugs are to be Hex Crimped. Hex crimped by means of a correctly matched crimping tool that only releases after full compression has been employed.

PS 1.5.3 Phase Identification

The color of the conductor for all 420-242 Volt circuits shall correspond to the color of the supply phase for that circuit (i.e. red, white and blue). All phases are to be correctly color coded.

The required colors are:

Busbars shall be color coded according the preferred colors of red, white, blue and black by means of a clearly visible plastic washer of diameter of at least 25mm.

Copper Busbars

*Busbars shall be made of hard drawn copper and shall comply with the requirements of SABS 1195 where relevant. The current density shall not exceed 2.5A / mm². **Busbars shall be tinned**, and no bare copper busbar shall be accepted. No heat shrink sleeving or tape wrapping shall be applied. The neutral busbar shall be dimensioned similarly to the other busbars.*

Clearance to earth and between phases shall be at least 20mm, unless otherwise specified by the Engineer.

Busbars shall be totally shrouded.

Earthing and earth busbar

The substation electrical equipment shall be earthed to IEC 62271-202 with the shortest route possible with the connecting points of the earthing to be marked and labelled.

A rectangular section earth busbar of bare hard drawn copper shall be provided to facilitate earthing of cable sheaths and armour. It shall have a cross sectional area of at least 70mm² and a minimum width of 25mm.

Earth Busbars must have sufficient holes pre-punched in them at least 5x11m, 4x12m, 4x7m.

PS 1.5.4 Main Circuit Breakers

The Minisub shall have Main Circuit Breakers fitted on LV side with correct KA ratings and amperage feeding the LV busbars for the 630KVA mini-sub. The circuit breaker shall be a suitably rated ABB , Electronic Assembly or similar approved type for the 630KVA Minisub. Only SABS approved MCBs or CBs shall be used.

PS 1.5.5 Metering

The Miniature Substation is to include a voltmeter 0-500Volt of size 90x90mm. A 0-500Volt seven position voltmeter selector switch protected by three 32A fuse holders with 6A HRC Fuses shall be used to select the various phases with indicator lamps.

Ammeters shall be flush mounted 90x90mm with instantaneous metering and maximum demand over a 15 minute period. Each phase shall be color coded fed by current transformers over the main busbars. The

200KVA mini-sub shall have a 500/5 (TBC by manufacturer) ratio current transformer. All current transformers shall be to IEC / SANS 61869-2 with a burden of 10-15VA Class1.

PS 1.5.6 Plug Socket and Lighting

A 30A DP /60mA Earth Leakage Unit with push trip button trip shall be fitted supplying a 15A industrial socket outlet and 5A fuse or circuit breaker protected light switch with bayonet lamp holder for LV Lighting in each compartment. The earth leakage shall be protected by a 20A HRC Fuse in a Fuse Holder.

PS 1.5.6.1 Feeder Circuits

Provision must be made for 2 x LV Feeder Circuits Breakers on the LV Panel below the Busbars. Cables shall be fitted from the busbars to the top of each MCB. All breakers shall be selected for discrimination and type 2 co-ordination and downstream co-ordination as determined by the tenderer or mini-sub manufacturer. The LV compartment shall be fitted with an ABB 1 x 1000A & 1 x 400A 400 Volt 3 phase fixed type main switch and busbars.

The following capacity and ratings for the breakers are required or are to be found on the accompanying drawings :

1 x 1000Amp TP LV Feeder Breaker (Feeder to the LV Main Panel/MCC) .

1 x 400Amp TP LV Feeder Breaker (Future feeder)

Provision or space shall be allowed for 1 x 250Amp TP LV Feeder Breaker (spare)

Note : The above breakers are to be confirmed before the tenders close and before ordering of the unit.

PS 1.5.6.2 Surge Protection

A 3-Way Surge Protection Device I_{max} 40ka Class II shall be supplied. A 3Phase 20A MCB of 15KA or higher shall protect the Surge Protection Device. Cables shall be fitted from the busbars to the top of the MCB and bottom of the Surge device looped to Earth.

The final protection requirements shall be determined by the mini-sub supplier or manufacturer.

PS 1.5.7 Cable Clamping

The LV compartment shall be fitted with a length of P2000 cable clamping rail.

PS 1.5.8 Requirements from the manufacturer :

Full layouts and wiring diagrams of the mini-sub shall be submitted to the Engineer and Client for comments and approval.

Full literature and a technical details of the mini-sub shall be provided with the tender.

The drawings are to be up-dated to as-builts and included in the O & M manuals. O & M manuals for the mini-sub shall be supplied on successful commissioning of the project. The test and commissioning data must be included in the manuals. Five hard copies and five (5) soft copies shall be submitted before the practical completion and hand-over of the project.

The mini-sub shall be adequately labelled with all safety and statutory notices provided. Danger and electrical warning signages shall be affixed to the unit.

The capacity and voltage details shall be provided on the external faces of the mini-sub.

PS 1.5.9 ROUTING TESTS

The following routine tests shall be carried out at the factory to IEC 62271-202 :

- Dielectric tests on the HV interconnections
- Voltage withstand tests on the auxiliary circuits
- Functional tests
- Verification of correct wiring and terminations

All test results shall be submitted to the Engineer and also included in the O & M manuals.

PS 1.5.10 TYPE TESTING

The substation shall be fully type tested and certified in accordance to IEC 62271-202 standards as follows :

- Dielectric tests
- Temperature rise tests
- IP tests (degree of protection)
- IK tests (mechanical impact tests)

All test results shall be submitted to the Engineer and also included in the O & M manuals.

PS 1.5.11 FAT TESTING

A full FAT (factory acceptance test) of the mini-sub must be carried out at the manufacturer's premises. At least two weeks notice shall be provided for the Engineer and Client to attend the FAT.

The cost for the Engineer's cost to attend FAT including all flights, transport, travel, accommodation, meals and entertainment must be included in the cost of the mini-sub.

ANNEXURE – A**MINI-SUBSTATION****RETURNABLE SCHEDULE (Compulsory - to be submitted with tender)**

Item	Required	Submitted by manufacturer
TRANSFORMER / MV GEAR		
Manufacturer	ABB, Electronic Assembly, Alstom	
Rating		
SANS/IEC/BS Standards		
Cooling		
Type of transformer (dry or oil cooled)		
Type of insulation medium or gas insulation		
No of phases		
Primary voltage		
Secondary voltage		
Frequency		
Tap changer		
Primary taps		
Type of tap changer		
Type of MV switchgear insulation		
Specifications comply to which codes and standards:		
Outside colour and specifications		
Vector group		
Conductive material		
FIXTURES AND FITTINGS		
Physical size of mini-sub		
Type of material of mini-sub and thickness		
Weight of mini-sub		
Type of doors		
Type of ventilation		
Wheels		
Hermitically sealed		
Bolted cover		
Conservator tank		
Silica gel breather		
Oil temperature pocket		
Oil temperature indicator F035		
Oil temperature indicator F036		
Oil level indicator		
Winding temperature indicator		
Pressure relief valve		
Buchholtz relay		
Lifting lugs		
Jacking pads		
Drain valve		
Flat base		
Skid base		

HV cable boxes		
LV cable boxes		
Marshalling box		
Earth leakage (EL305B)		
Busbar ratings		
Type of MCB or ACB		
MCB, make and amperage (A)		
ACB, make and amperage (A)		
Pole mount		
Type C bushes or other type		
Tank		
Radiators		
Filler cap		
Wiring and GA drawings provided (Required)		
Other		
Other		
Other		

Name of contractor :

Signature :

Name of signatory :

Date:

Contact details :.....

Email address :

Company stamp :

C4 SITE INFORMATION

The following locality sketch is included:

Site Locality Plan



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-07-1734-2026 REFURBISHMENT AND UPGRADE OF MARGATE STORM-DAMAGED INFRASTRUCTURE, WASTEWATER TREATMENT WORKS AND EFFLUENT MAIN (PHASE 2)		
DRAWING NUMBER	DRAWING DESCRIPTION	REV
V45-06-01-000-LPLAY-T	LOCALITY PLAN	00
V45-06-01-001-TWLAY-T	SITE PLAN MARGATE WASTEWATER TREATMENT WORKS	00
V45-06-01-002-SRLAY-T	SITE PLAN MARGATE EXT.3 SEWER RETICULATION	00
V45-06-01-003-IWLAY-T	EXISTING INLET PLANT	00
V45-06-01-004-DWPLAY-T	EXISTING DEWATERING PLANT & BLOWER ROOM	00
V45-06-01-005-WLAY-T	EXISTING WORKSHOPS	00
V45-06-01-006-GHLAY-T	NEW GUARDHOUSE	00
V45-06-01-007-OLAY-T	EXISTING OFFICES	00
V45-06-01-008-ABLAY-T	EXISTING CHANGEROOMS & ABLUTION	00
V45-06-01-009-CRLAY-T	EXISTING CHANGEROOMS	00
V45-06-01-010-WLAY-T	EXISTING WORKSHOP	00
V45-06-01-011-OSLAY-T	EXISTING OFFICES, STORE & ABLUTIONS	00
V45-06-01-012-EOLAY-T	EXISTING OFFICES 2	00
V45-06-01-013-BWLAY-T	PROPOSED NEW BOUNDARY WALL	00
V45-06-01-014-FLW-T-00	OPTIMIZE PROCESS FLOW DIAGRAM	00
V45-06-01-015-SB-T-00	SIGN BOARD	00
V45-02-03-000-TTLAY-T	EXISTING PIPE WORK TO TREATMENT TRAIN 3	00
V45-02-03-001-RASLAY-T	SLUDGE RE-CIRCULATION PS LAYOUT AND DETAILS	00
V45-02-05-000-RLAY-T	WWTW CONCRETE ACCESS ROAD LAYOUT: (0,000km to 0,537km)	00
V45-02-05-001-RLSEC-T	LONGSECTIONS	00
V45-02-05-002-RCSEC-T	WWTW CONCRETE ACCESS ROAD CROSS SECTIONS: (0,000km to 0,520km)	00
V45-02-05-003-PLAY-T	WWTW OFFICE PARKING LOT LAYOUT	00
V45-02-05-004-UADET-T	URBAN ACCESS AND HEADWALL STANDARD DETAIL	00
V45-02-05-005-SDET-T	DEPRESSED INLET AND ROCK BOLSTERS STANDARD DETAIL	00
V45-02-05-006-CDET-T	CONCRETE PAVEMENT DETAIL	00
V45-06-03-002-CLLAY-T	CHLORINE DOSING - TT1 EXISTING CANAL - WALL RAISED REINFORCEMENT DETAILS	00
V45-06-03-003-CLCLAY-T	CHLORINE DOSING - TT1 NEW CANAL LAYOUT AND DETAILS	00
V45-06-03-004-CLRLAY-T	CHLORINE DOSING - TT1 NEW CANAL REINFORCEMNT DETAILS	00

MARGATE WASTE WATER TREATMENT
WORKS & SEWER RETICULATION

MARGATE WASTE WATER TREATMENT
WORKS & SEWER RETICULATION



Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image © 2025 Airbus



LOCALITY MARGATE SEWER RETICULATION
SCALE 1:2000



LOCALITY PLAN WWTW
SCALE 1:500

 160mm Ø uPVC CL34
 200mm Ø uPVC CL34
 MARGATE EXT. 3 SEWER RETICULATION BOUNDARY
 110mm Ø uPVC CL34 HOUSEHOLD CONNECTIONS

REV. NO.	DATE	DESCRIPTION
----------	------	-------------

CLIENT DEPARTMENT SIGNATURES

APPROVED BY _____

SIGNATURE _____

Checked by Professional Consultant

Signature: _____ Date: _____

Consultant	
------------	--



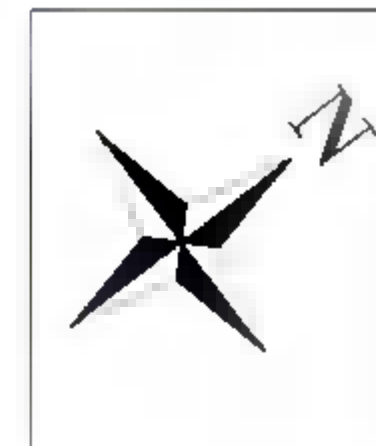
Project	Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)
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1	Drawing description
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LOCALITY PLAN

Drawn:	Date:
J RAMGHULAM	AUGUST 2026
Scale(s):	Sheet No.:
AS SHOWN	Sheet 1 OF 1
Consultant Drawing number	Drawing Size
V45-06-01-000-LPLAY-T-00	A0
Client Drawing number	

TENDER DRAWING



LEGEND

Services

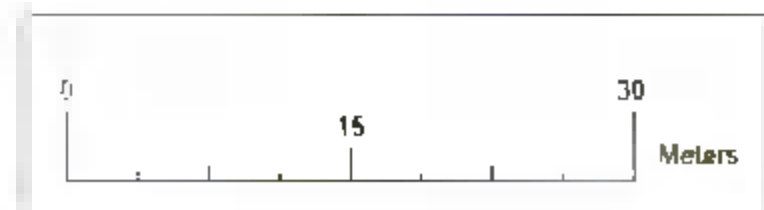
BOUNDARY WALL

EXISTING ACCESS ROAD

FLOW

RECIRCULATION

SLUDGE



SITE PLAN
SCALE 1:400

REV. NO.	DATE	DESCRIPTION
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CLIENT DEPARTMENT SIGNATURES

APPROVED BY

SIGNATURE

Checked by Professional Consultant

Signature: Date:

Consultant



144 Mark Street
P.O Box 1460
Vryheid
3100
Tel :034 980 7242
Fax :034 983 2765
Email :info@dlveng.co.za



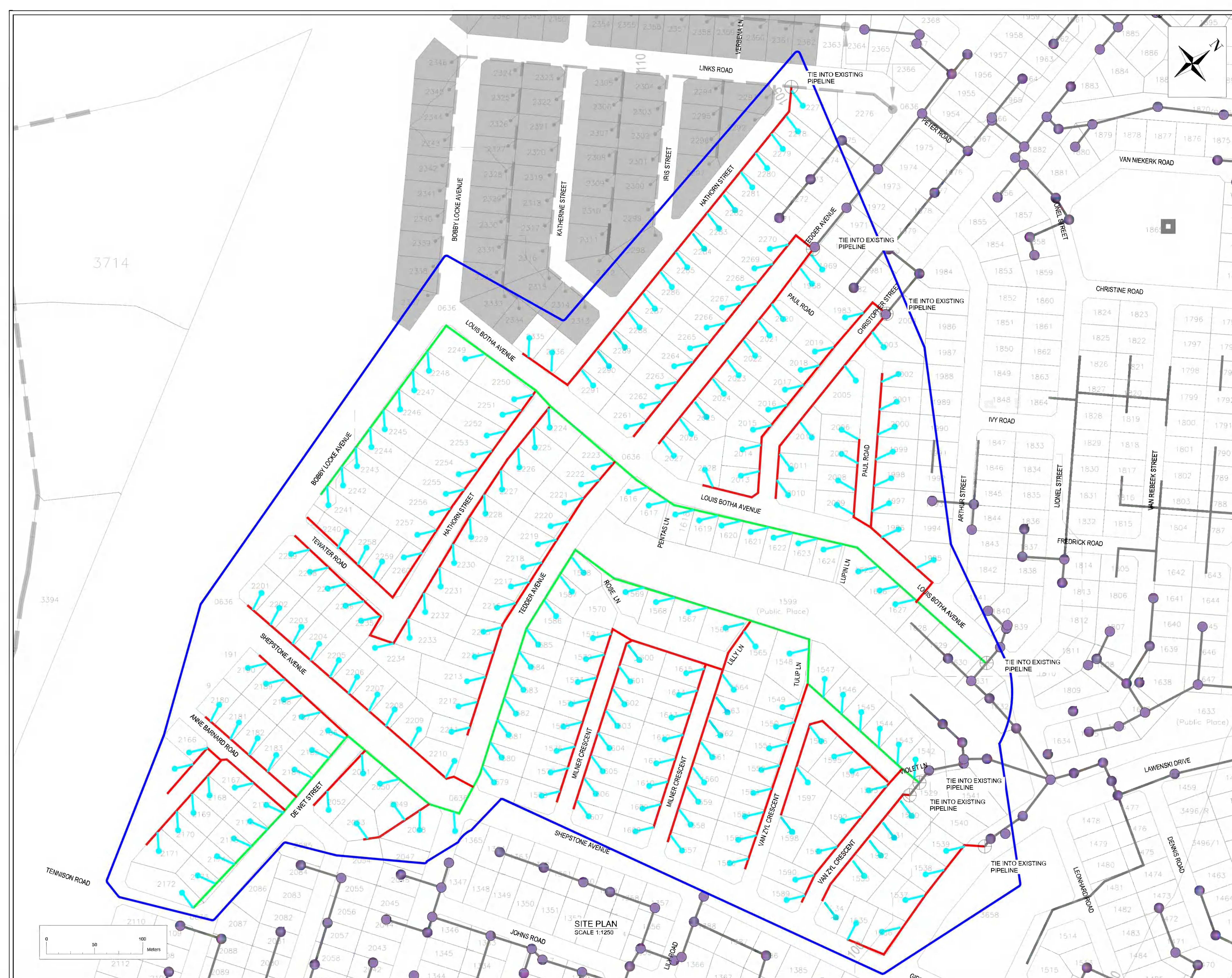
UGU
DISTRICT
MUNICIPALITY

Project
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)

Drawing description
SITE PLAN
MARGATE WASTE WATER TREATMENT WORKS

Drawn: J RAMGHULAM	Date: AUGUST 2026
Scale(s): AS SHOWN	Sheet No.: Sheet 1 OF 1
Consultant Drawing number: V45-06-01-001-TWLAY-T-00	Drawing Size: A0
Client Drawing number:	

TENDER DRAWING



- LEGEND**
- 160mm Ø uPVC CL34
 - 200mm Ø uPVC CL34
 - MARGATE EXT. 3 SEWER RETICULATION BOUNDARY
 - 110mm Ø uPVC CL34 HOUSEHOLD CONNECTIONS

REV. NO.	DATE	DESCRIPTION
CLIENT DEPARTMENT SIGNATURES		
APPROVED BY		
SIGNATURE		
Checked by Professional Consultant		
Signature:		Date:
Consultant		



DLV
PROJECT MANAGERS
AND ENGINEERS (Pty) Ltd

144 Mark Street
P.O. Box 1460
Vryheid
3100
Tel : 034 980 7242
Fax : 034 983 2765
Email : info@diveng.co.za



**UGU
DISTRICT
MUNICIPALITY**

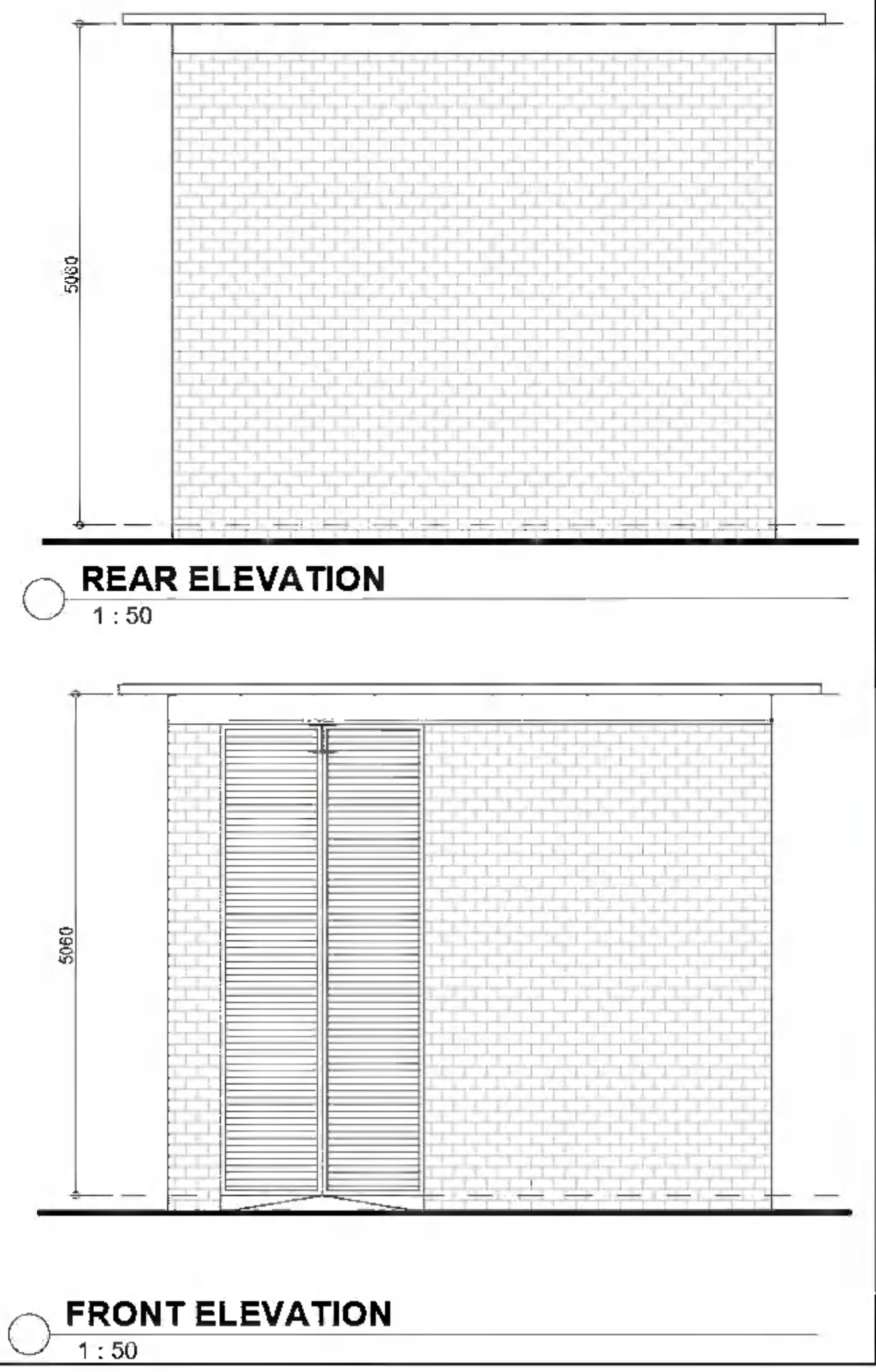
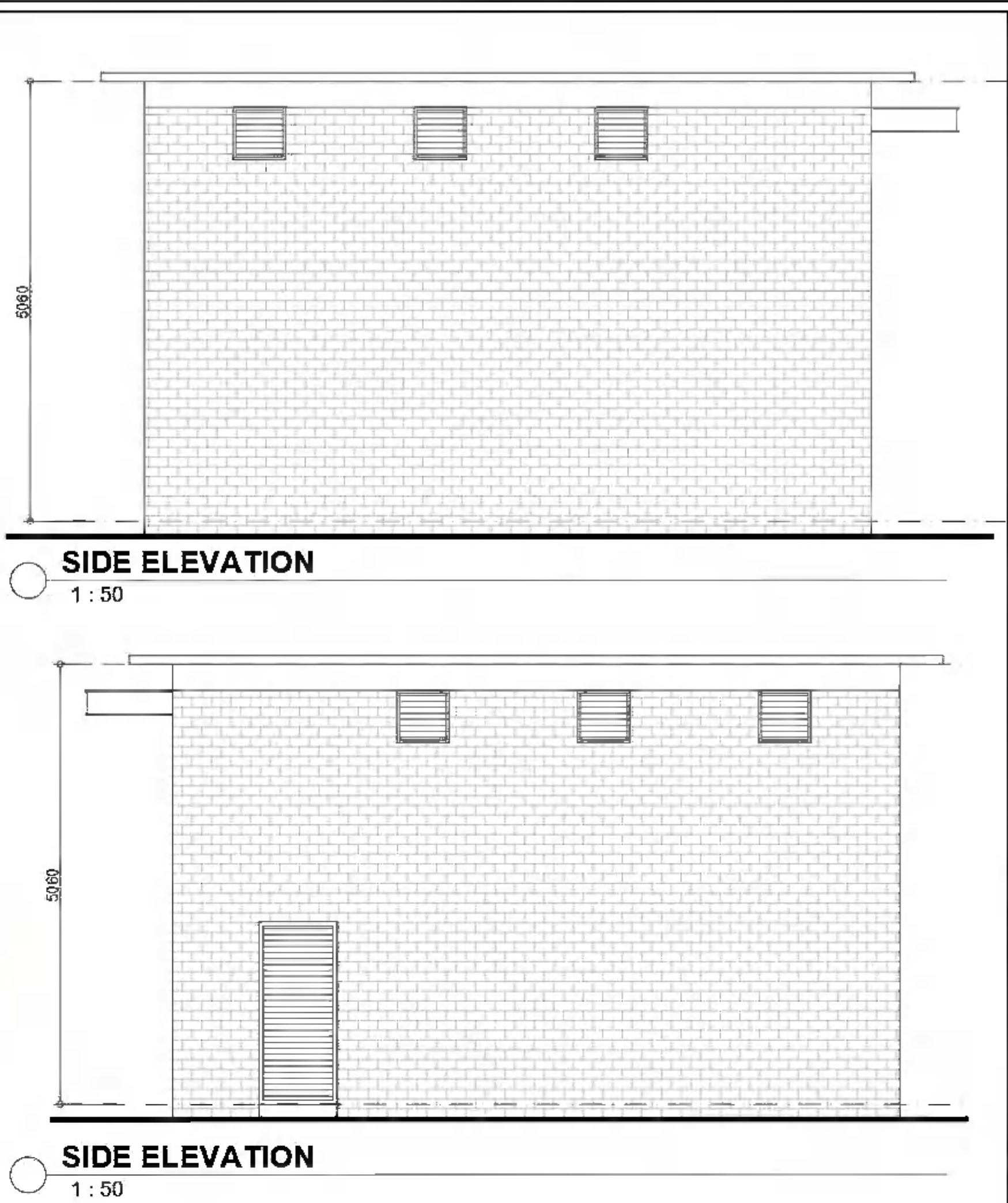
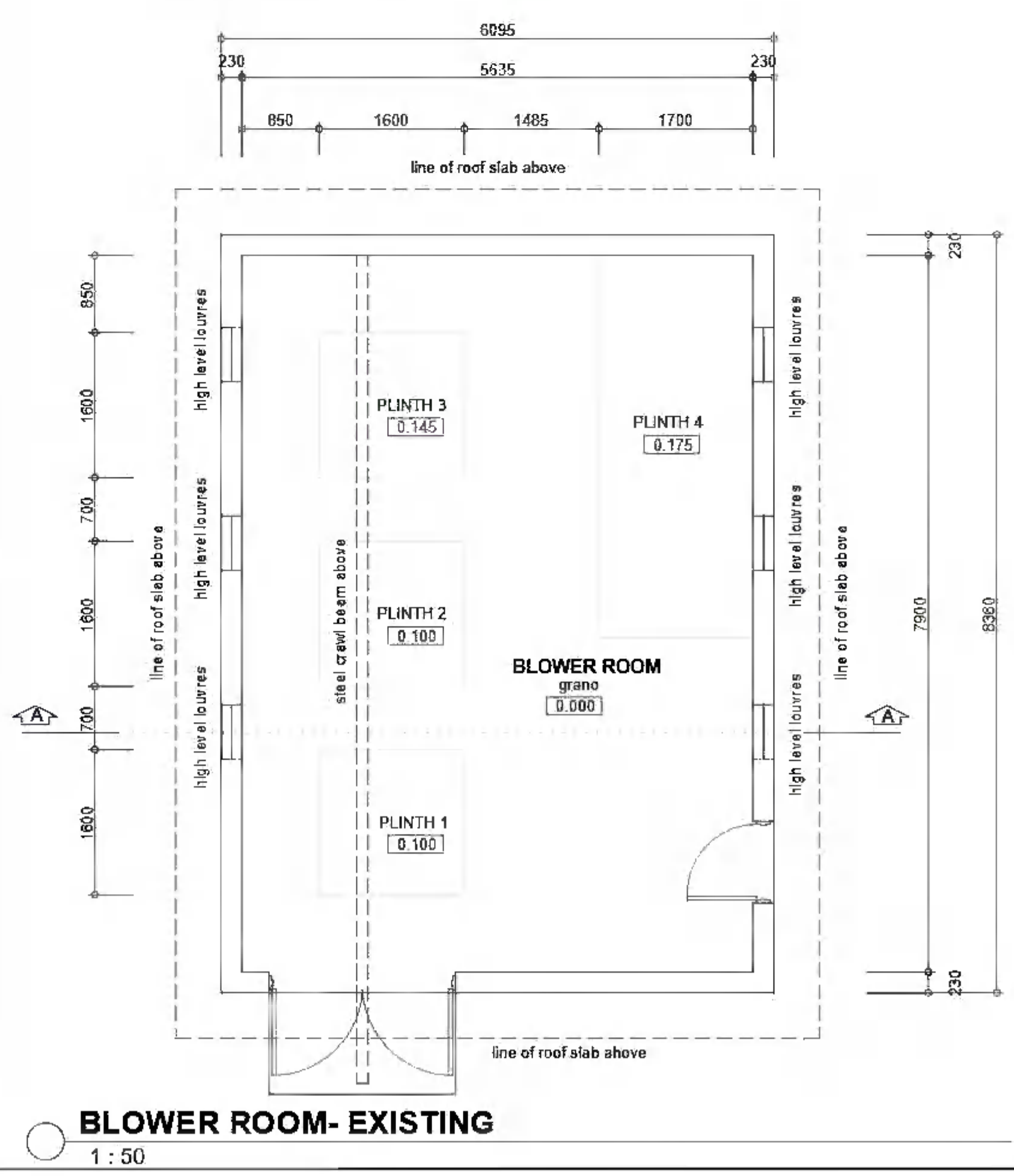
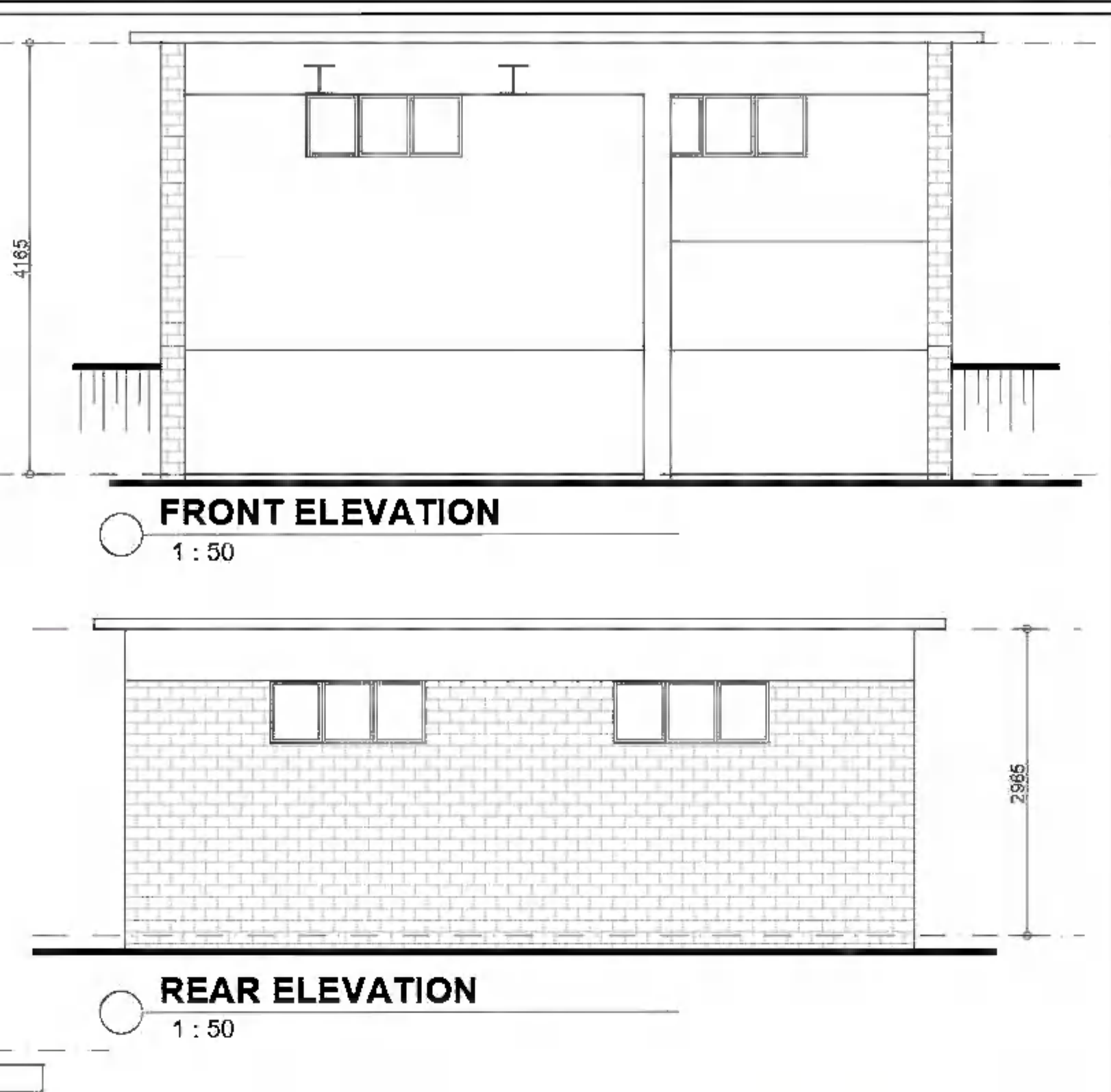
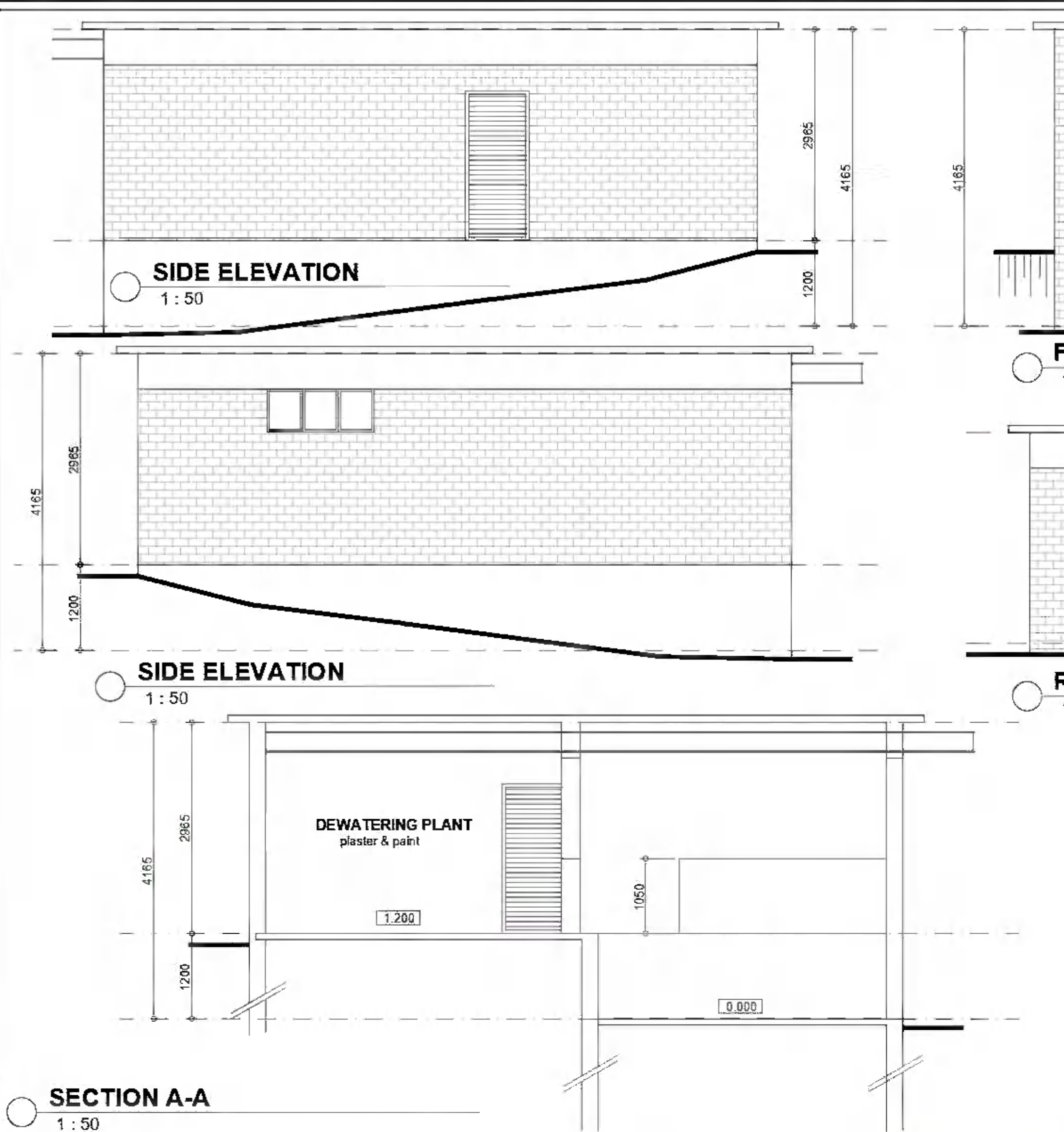
Ugu District Municipality

Project
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)

Drawing description
**SITE PLAN MARGATE
EXT. 3 SEWER RETICULATION**

Drawn: J RAMGHULAM	Date: AUGUST 2026
Scale(s): AS SHOWN	Sheet No.: Sheet 1 of 1
Consultant Drawing number V45-06-01-002-SRLAY-T-00	Drawing Size A0
Client Drawing number	

TENDER DRAWING



NOTES		
REV NO.	DATE	DESCRIPTION
CLIENT DEPARTMENT SIGNATURES		
APPROVED BY		
SIGNATURE		
Checked by Professional Consultant		
A MANGRAY		
Signature		SEPTEMBER 2024
Consultant		Date
 PROJECT MANAGERS & ENGINEERS 144 Mark Street Vryheid P.O. Box 1460 Vryheid 3100 Tel: 034 980 7242 Fax: 034 983 2755 Email: info@dlveng.co.za		
 UGU DISTRICT MUNICIPALITY Ugu District Municipality		
Contract		
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)		
Drawing description		
MARGATE WASTE WATER EXISTING DEWATERING PLANT & BLOWER ROOM		
Drawn: N.G MANQELE		Date: AUGUST 2026
Scale(s): 1:50		Sheet No.: Sheet 1 of 1
Consultant Drawing number V45-06-01-004-DWPLAY-T-00		Drawing Size A1
Client Drawing number		

EXTERNAL PICTURES



GROUND FLOOR
PLAN- EXISTING

BUILDING REQUIREMENTS

AREA	COMMENTS	MEASUREMENTS
Roof	Ex. fibre cement roof to be removed and replaced with new.	255sqm
Ceiling	- new gypsum ceiling and cornices to be installed.	255sqm
Walls	- Internal & external walls to be prepared and painted.	internal area: 000sqm
Window	- Replace cracked window glazing where necessary. - Windows to be re-varnished.	
Floor	- Existing floors to have new epoxy finish.	58sqm
Door	- All timber doors & roller shutter doors to be replaced	
Plumbing	- New wc & plumbing for ablution - New whb & plumbing for ablution	quantity : x1 quantity : x1
General	- New Fire extinguish to be installed - Check and replace all electrical fittings.	

Recommendations:

Building to be demolished due to deteriorated roof structure, lack of proper light and ventilation on the building, electrical fitting not installed or vandalised sanitaryware and plumbing vandalised, flooring not even.

INTERNAL PICTURES



ELECTRICAL LEGEND

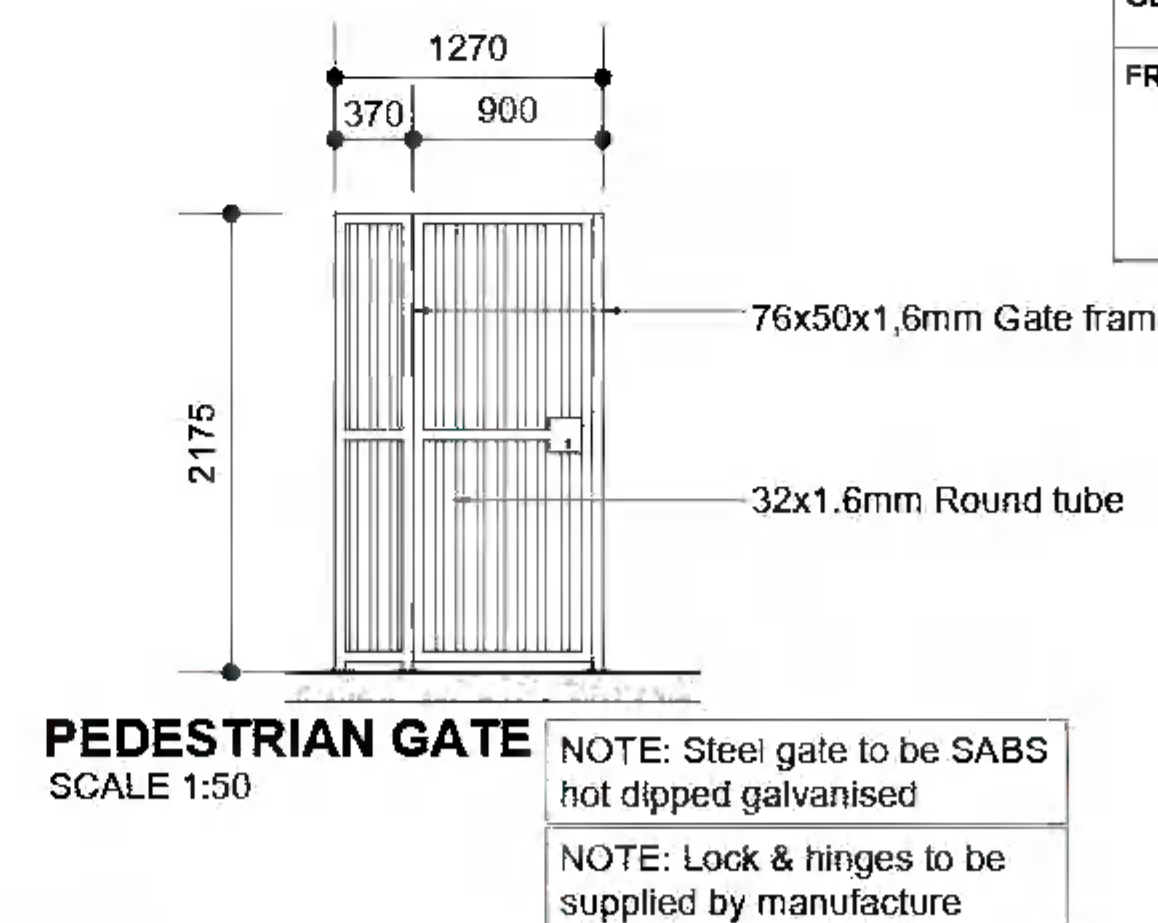
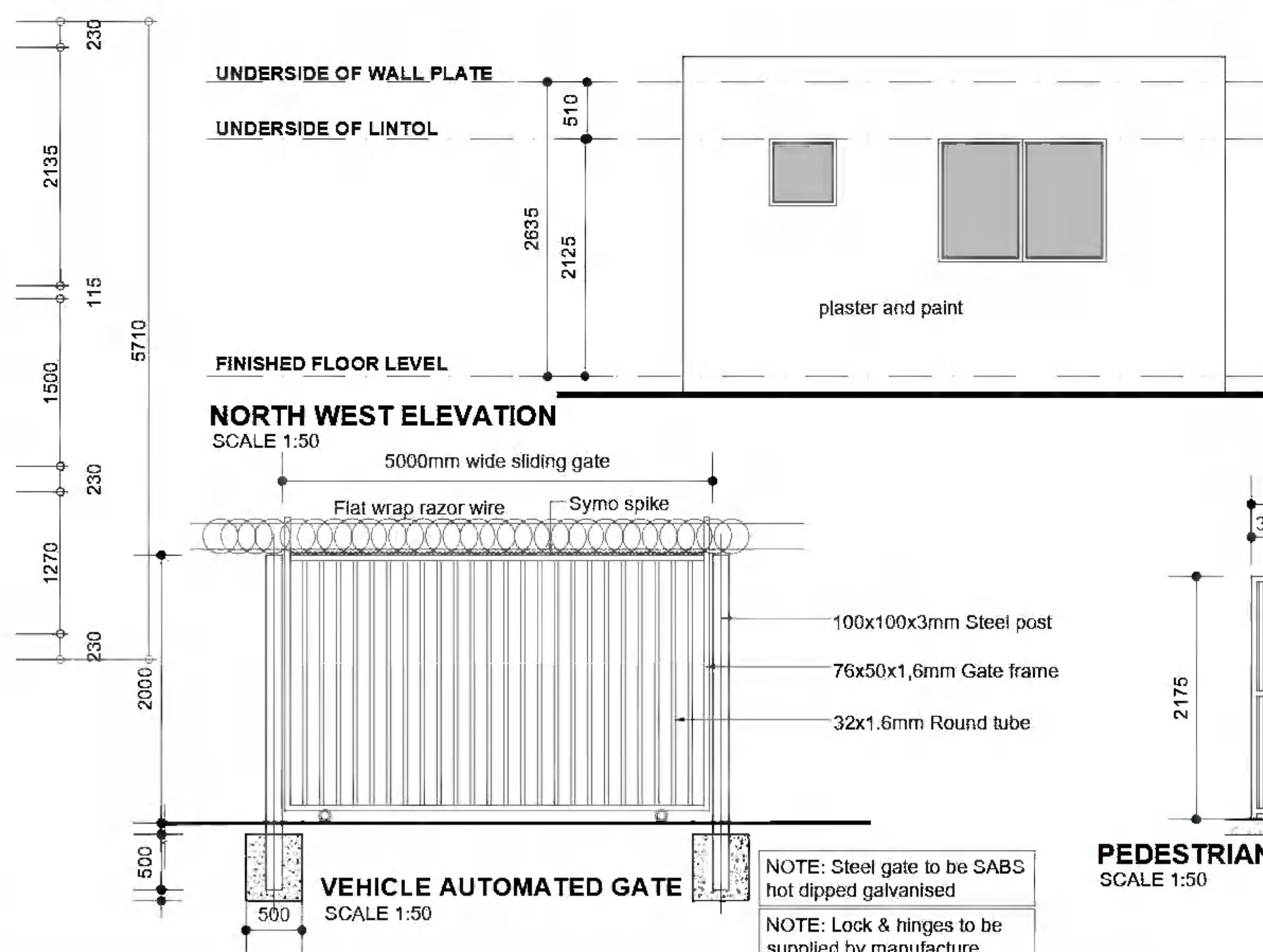
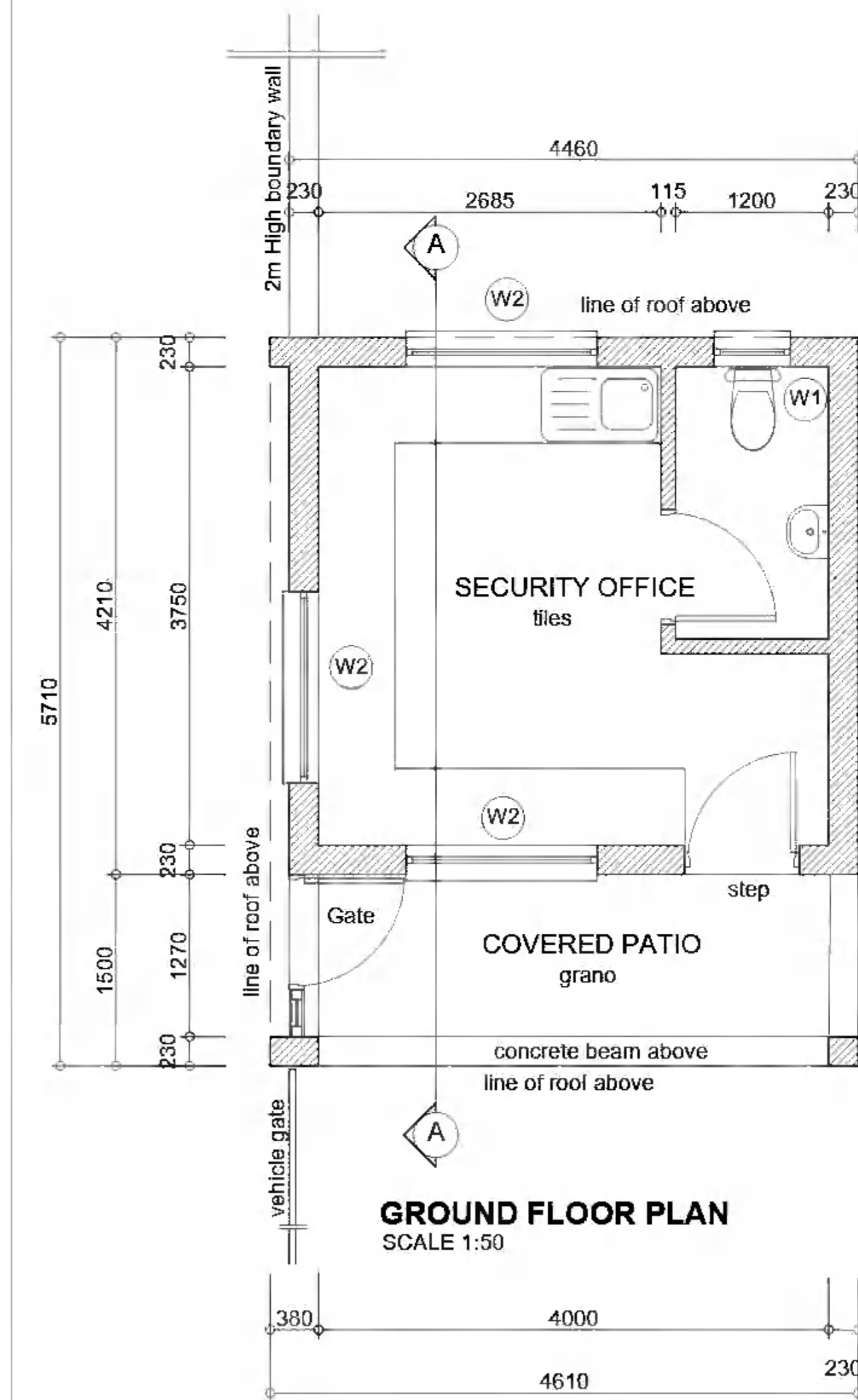
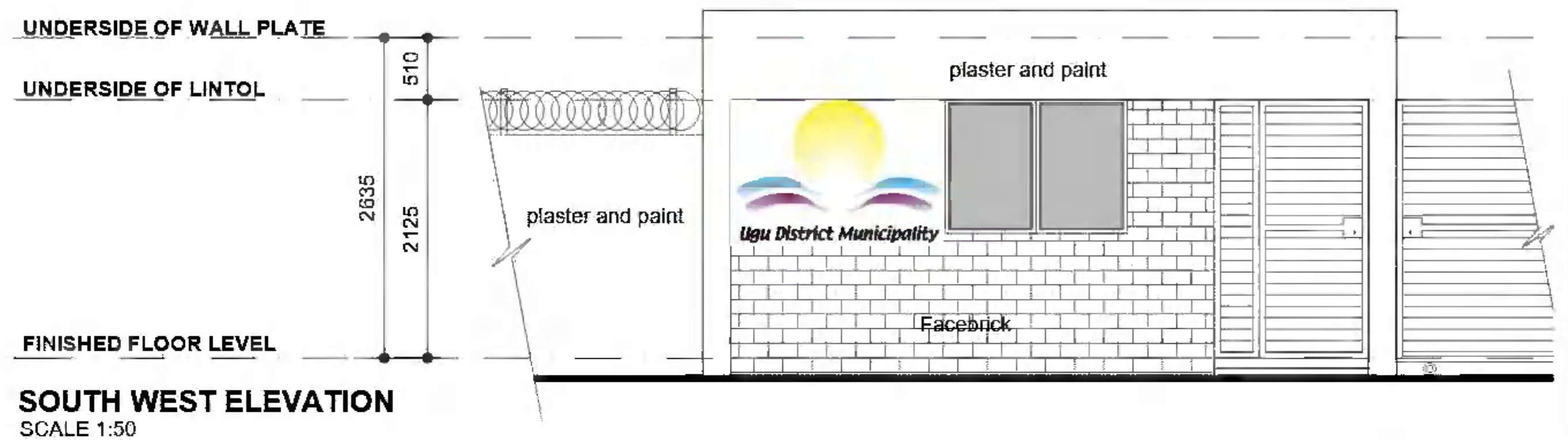
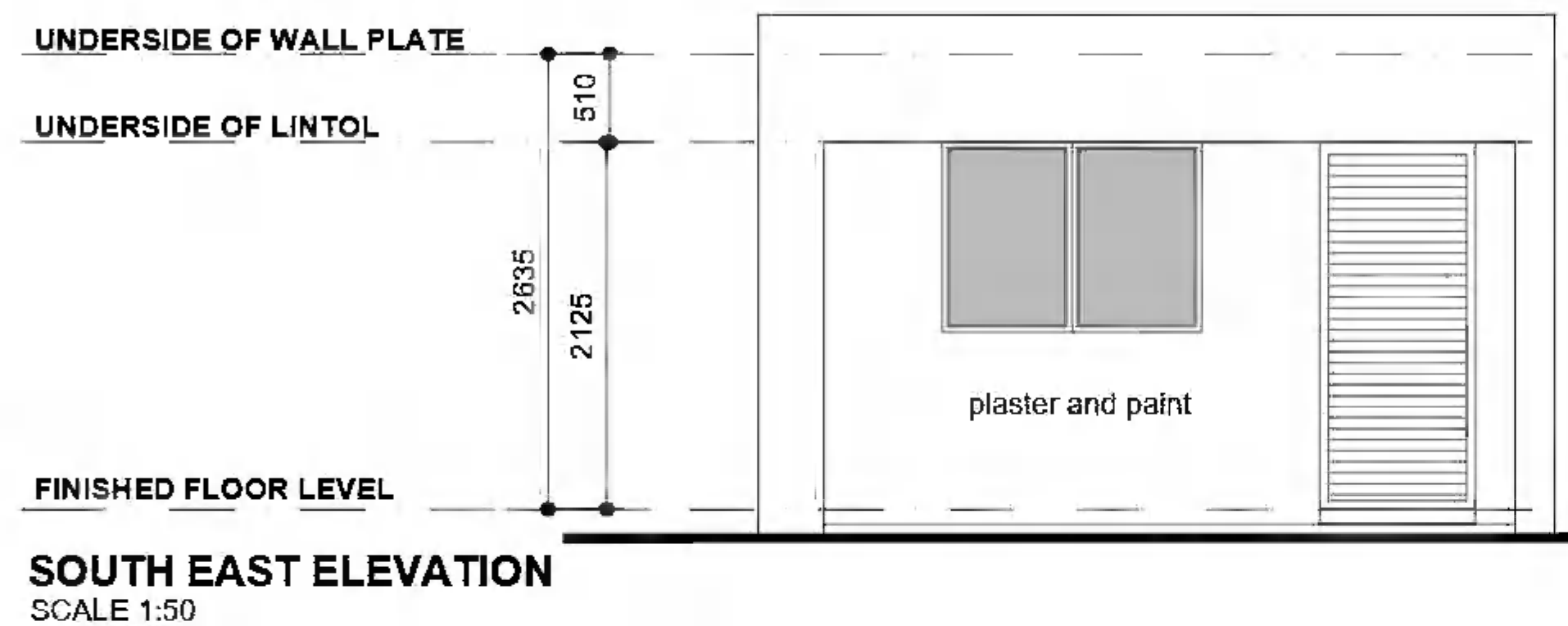
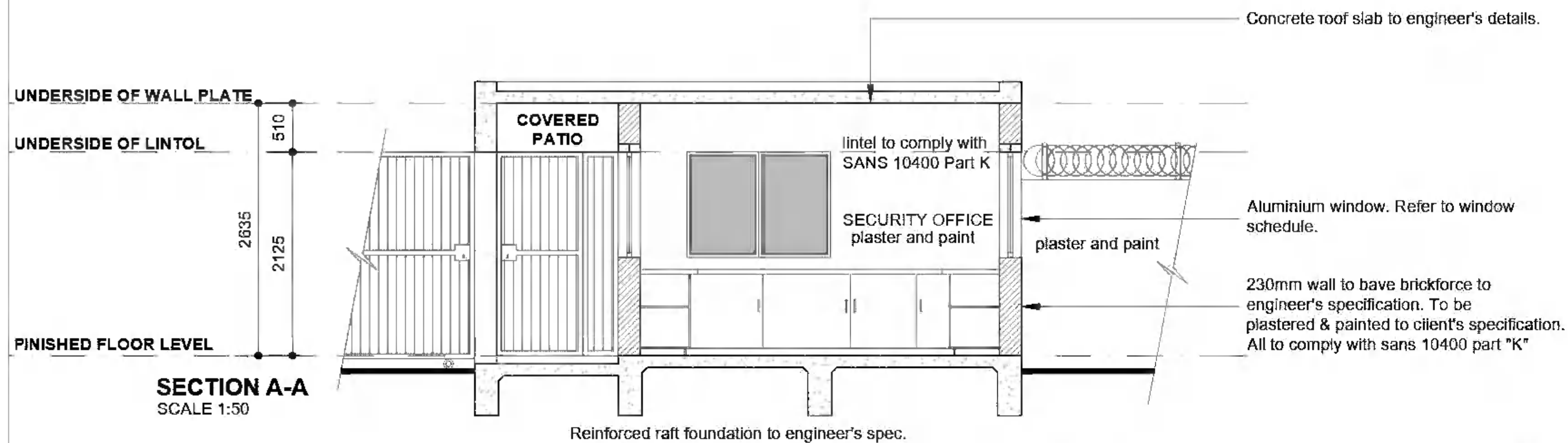
Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

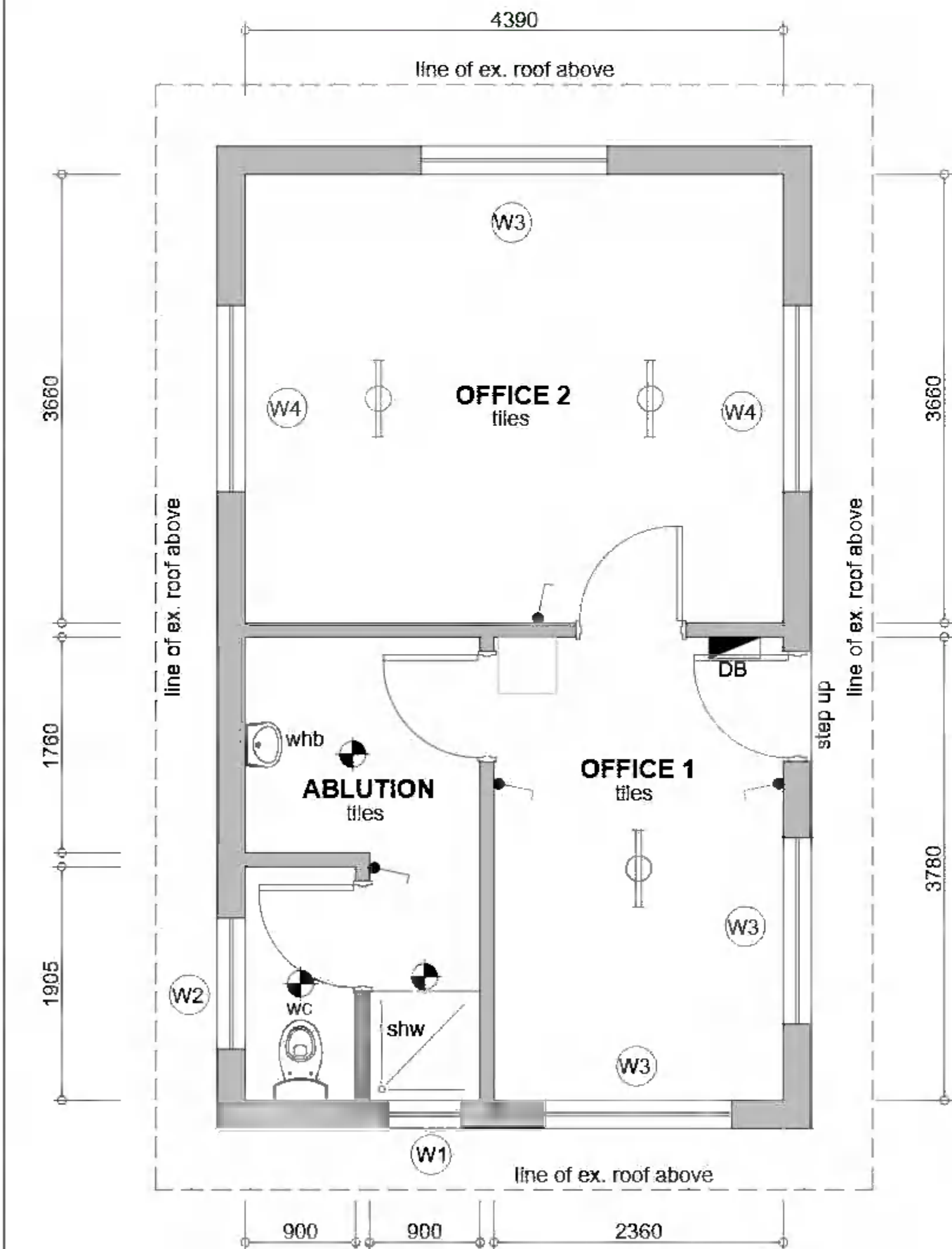
Refurbishment to Workshops

Client Drawing number	Drawn	Drawn by	Checked by Professional Consultant
V45-06-B1-005-WLAY-T-00	30 June 2025	NGM	A MANGRAY





WINDOW SCHEDULE		
U/S LINTOL	535	1500
	645	1100
F.F.L	2100	2100
WINDOW No.	01	02
No. OFF	1	3
AREA	0.34sqm	1.65sqm
GLAZING	4mm MONOLITHIC ANNEALED GLASS	4mm MONOLITHIC ANNEALED GLASS
FRAME	ALUMINIUM 30.5mm SECTION WHITE POWDER COATED, 60-90 MICRON THERMAL BREAK FRAMING RECOMMENDED.	ALUMINIUM 30.5mm SECTION WHITE POWDER COATED, 60-90 MICRON THERMAL BREAK FRAMING RECOMMENDED.



WINDOW SCHEDULE	
U/S UNTEL	535
2100	645
1070	645
FEL	2100
WINDOW No.	01
No. OFF	2
AREA	0.34sqm
GLAZING	4mm MONOLITHIC ANNEALED GLASS
FRAME	ALUMINIUM 30.5mm SECTION WHITE POWDER COATED, 60-90 MICRON THERMAL BREAK FRAMING RECOMMENDED.
WINDOW No.	02
No. OFF	1
AREA	0.69sqm
GLAZING	4mm MONOLITHIC ANNEALED GLASS
FRAME	ALUMINIUM 30.5mm SECTION WHITE POWDER COATED, 60-90 MICRON THERMAL BREAK FRAMING RECOMMENDED.
WINDOW SCHEDULE	
1520	645
2100	985
03	04
3	2
0.98sqm	1.49sqm
4mm MONOLITHIC ANNEALED GLASS	4mm MONOLITHIC ANNEALED GLASS
ALUMINIUM 30.5mm SECTION WHITE POWDER COATED, 60-90 MICRON THERMAL BREAK FRAMING RECOMMENDED.	ALUMINIUM 30.5mm SECTION WHITE POWDER COATED, 60-90 MICRON THERMAL BREAK FRAMING RECOMMENDED.

BUILDING REQUIREMENTS

AREA	COMMENTS	MEASUREMENTS
Roof	- Existing concrete roof tiles certain area leaking. Therefore to be waterproofed - Fibre cement barge board to be installed. Change room 2	124sqm Length- 3800mm
Ceiling	Remove existing gypsum ceiling and cornices to be removed and replaced new.	82sqm
Walls	- Internal & external walls to be prepared and painted. 115x85mm barn wall @ shower to be tiled.	internal area: 167sqm external area: 7.6sqm
Window	- Replace cracked window glazing where necessary. - Window mechanism for Kitchen to be replaced or fixed.	
Floor	- Existing tiles to be pressured cleaned & re-grouted where necessary - Existing floor tiles at Kitchen to be replaced	58sqm 24sqm
Door	All showers & wc's to be installed with new locks and handles	quantity : x9
Plumbing	- New shower heads & taps to be installed at change room 1 - Service or replace geyser system - New wall mounted taps for whb to be installed at change room 1 with all necessary plumbing - New stainless steel double sink, wall mounted tap and all plumbing to be installed at the Kitchen. - New whb waste pipe for Change room 2 to be installed.	quantity : x3 quantity : 1 quantity : 1 quantity : 1
General	- New Fire extinguish to be installed at Kitchen. - Check and replace all electrical fittings as it's outdated. - Fire extinguish to be checked by specialist or replaced.	

ELECTRICAL LEGEND

Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Comments

Contract

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

Drawing description

EXISTING OFFICES

Consultant Drawing number

V45-06-01-007-OLAY-T-00

Date

30 June 2025

Drawn by

NGM

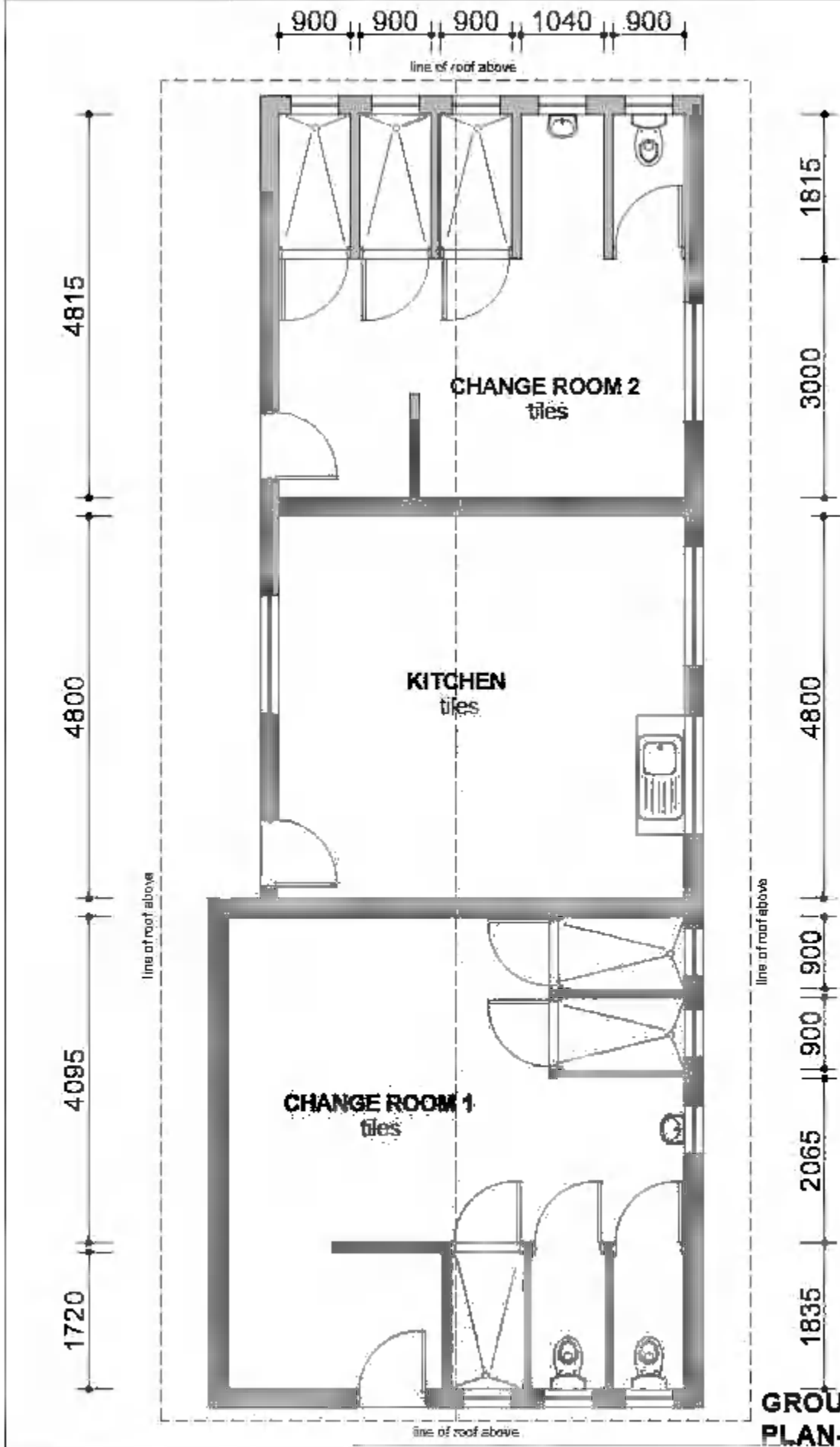
Checked by Professional Consultant

A MANGRAY



Ugu District Municipality

PROJECT MANAGERS & ENGINEERS
DLV
144 Mark Street Vryheid
P.O. Box 1480
Vryheid 3100
Tel: 034 980 7242
Fax: 034 983 2765
Email: info@dlveng.co.za



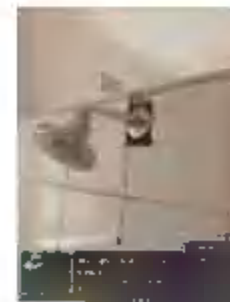
ELECTRICAL LEGEND	
Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Comments

Change room 1

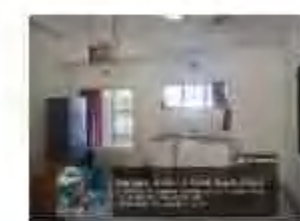


Change room 2



BUILDING REQUIREMENTS		
AREA	COMMENTS	MEASUREMENTS
Roof	- Existing concrete roof tiles certain area leaking. Therefore to be waterproofed - Fibre cement barge board to be installed. Change room 2	124sqm Length- 3800mm
Ceiling	Remove existing gypsum ceiling and cornices to be removed and replaced new.	82sqm
Walls	- Internal & external walls to be prepared and painted. 115x85mm barn wall @ shower to be tiled.	internal area: 167sqm external area: 7.6sqm
Window	- Replace cracked window glazing where necessary. - Window mechanism for Kitchen to be replaced or fixed.	
Floor	- Existing tiles to be pressured cleaned & re-grouted where necessary - Existing floor tiles at Kitchen to be replaced	58sqm 24sqm
Door	All showers & wc's to be installed with new locks and handles	quantity : x9
Plumbing	- New shower heads & taps to be installed at change room 1 - Service or replace geyser system - New wall mounted taps for whb to be installed at change room 1 with all necessary plumbing - New stainless steel double sink, wall mounted tap and all plumbing to be installed at the Kitchen. - New whb waste pipe for Change room 2 to be installed.	quantity : x3 quantity : 1 quantity : 1 quantity : 1
General	- New Fire extinguish to be installed at Kitchen. - Check and replace all electrical fittings as it's outdated. - Fire extinguish to be checked by specialist or replaced.	

Kitchen



Contract

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

Drawing description

EXISTING CHANGEROOMS & ABLUTIONS

Consolidated drawing number

V45-06-01-008-ABLAY-T-00

Date

30 June 2025

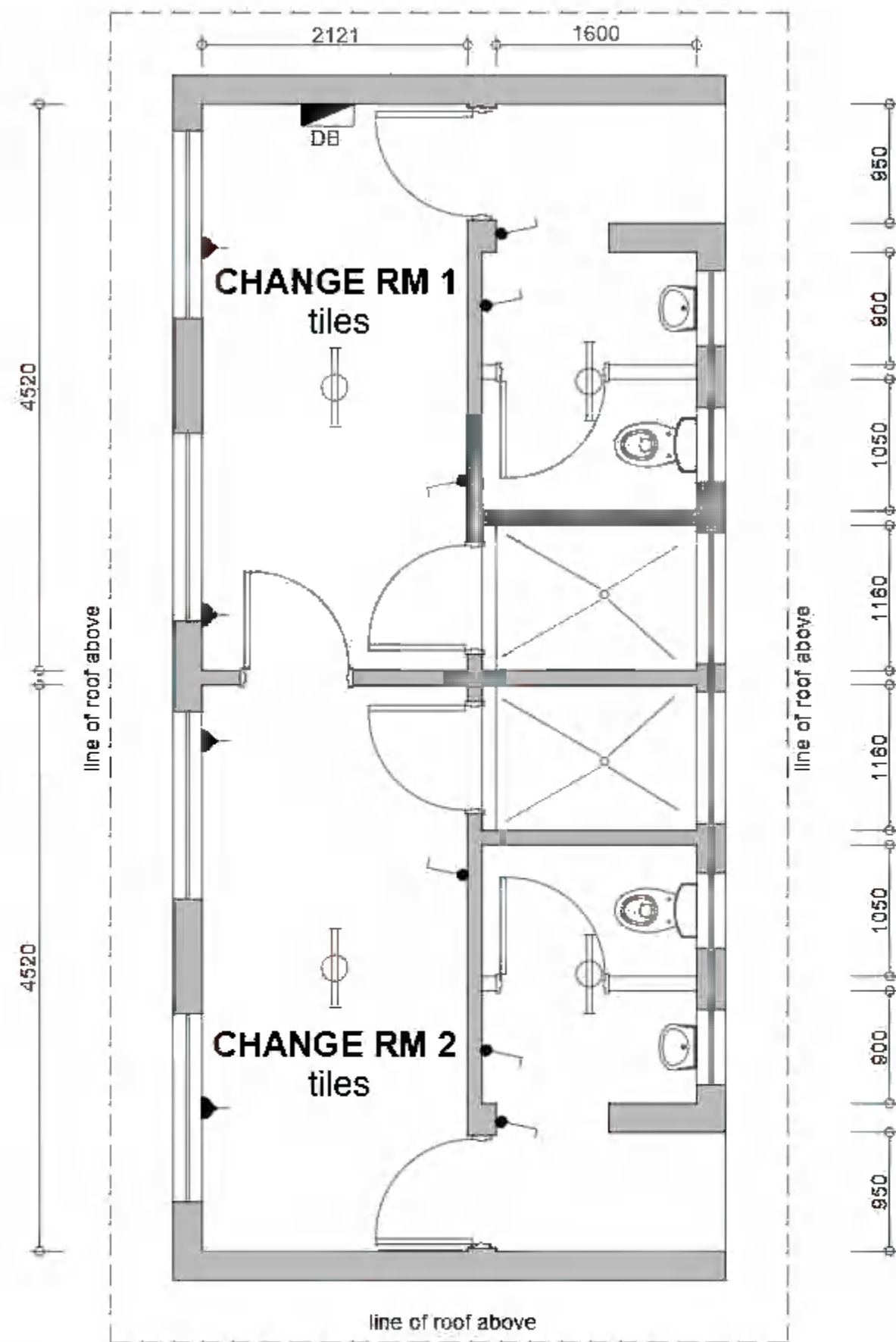
Drawn by

NGM

Checked by Professional Consultant

A MANGRAY





GROUND FLOOR PLAN- EXISTING

BUILDING REQUIREMENTS		
AREA	COMMENTS	MEASUREMENTS
Roof	- Existing concrete roof slab to be waterproofed	57.4sqm
Ceiling	- Prepare and paint soffit	57.4sqm
Walls	- Internal & external walls to be prepared and painted. - 115x85mm barn wall @ shower to be tiled.	internal area: 167sqm external area: 7.6sqm
Window	- Replace cracked window glazing where necessary.	
Floor	- Existing tiles to be pressured cleaned & re-grouted where necessary	36.5sqm
Door	- semi-solid doors at showers and change rooms division to be painted & to have all necessary hinges and door handles	quantity : 3
Plumbing	- Install new shower heads & tabs for both showers - Service or replace solar geyser system	quantity : x2 quantity : 1
General	- Fire extinguish to be checked by specialist or replaced. - Check and replace all electrical fittings as it's outdated.	



ELECTRICAL LEGEND	
Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Comments

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

EXISTING CHANGE ROOMS

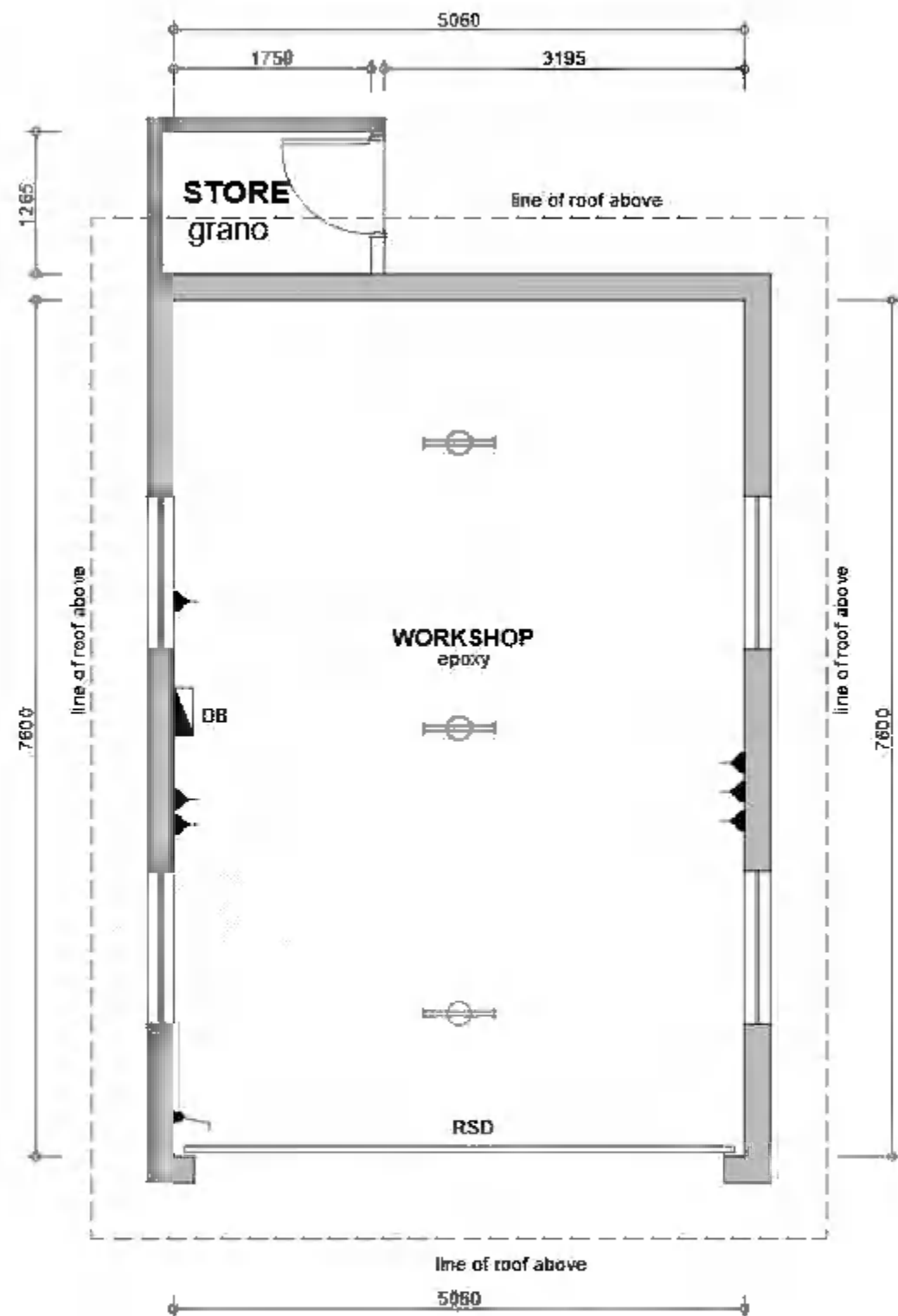
Consistent drawing number: V45-08-01-003-ERLAY-T-08 Date: 30 June 2025 Drawn by: NGM Checked by: A MANGRAY

Ugu District Municipality

PROJECT MANAGERS & ENGINEERS

DLV

144 Mark Street Vryheid
P.O. Box 1480
Vryheid 3109
Tel: 034 980 7242
Fax: 034 983 2766
Email: info@dlv.co.za



GROUND FLOOR PLAN- EXISTING
1 : 100

BUILDING REQUIREMENTS		
AREA	COMMENTS	MEASUREMENTS
Roof	- Existing concrete roof slab to be waterproofed	59sqm
Ceiling	- Prepare and paint sofit.	59sqm
Walls	- Internal & external walls to be prepared and painted.	internal area: 75sqm external area: 7.4sqm
Floor	- New floor epoxy to be applied.	38.4sqm
General	- Fire extinguish to be checked by specialist or replaced. - Check and replace all electrical fittings. - Replace cracked window glazing where necessary. - Roller shutter door pully mechanism to be serviced.	



ELECTRICAL LEGEND

Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Comments

Control

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

Drawing description

EXISTING WORKSHOP

Consultant drawing number

V45-06-01-010-WLAY-T-00

Date

30 June 2025

Drawn by

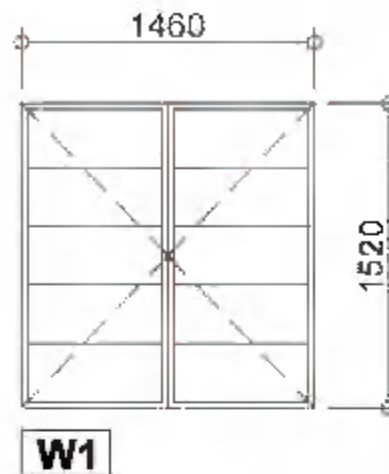
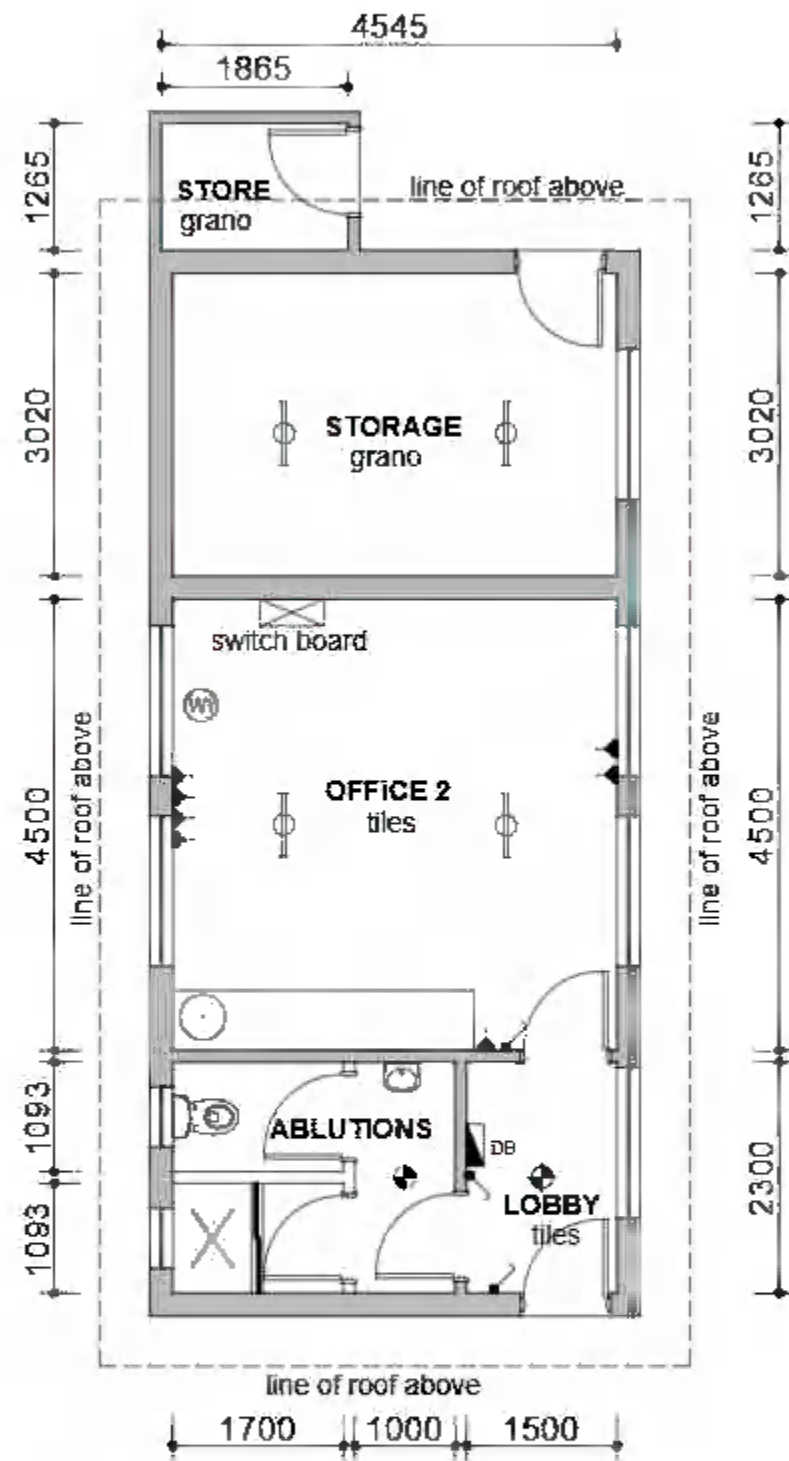
NGM

Checked by Professional Consultant

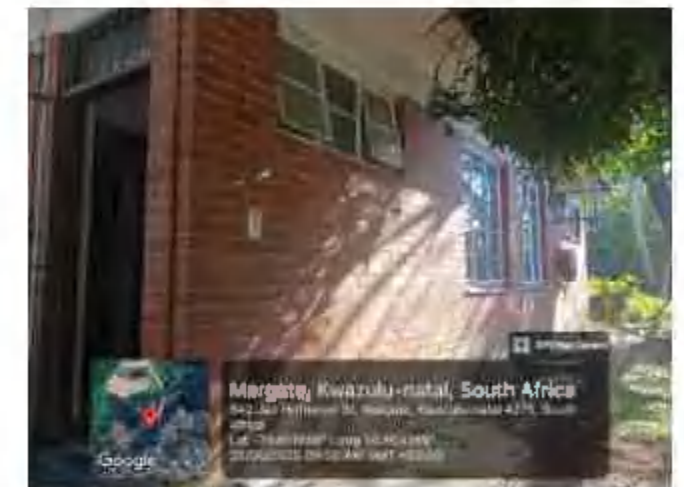
A MANGRAY



144 Mark Street Vryheid
P.O. Box 1480
Vryheid 3109
Tel: 034 980 7242
Fax: 034 983 2788
Email: info@dlveng.co.za



BUILDING REQUIREMENTS		
AREA	COMMENTS	MEASUREMENTS
Roof	- Existing concrete roof slab to be waterproofed - New 75mm Ø PVC rainwater downpipe.	68.4sqm 2700mm length
Ceiling	Prepare and paint soffit.	68.4sqm
Walls	Internal & external walls to be prepared and painted.	internal area: 133sqm external area: 8.5sqm
Window	Remove and make good for new W1 window to match existing.	quantity : 1
Floor	Remove existing floor tiles and replace with new.	30.6sqm
Door	Front & rear timber door to be replaced due to weathering.	quantity : 3
Plumbing	- New 1000x2000mm aluminium sliding shower door to be provided. - New water supply pipe for fire hose reel to be installed, size and length to be determined on site. - Existing gyser to be checked & serviced by plumber.	quantity : 1 quantity : 1
General	- Fire extinguish to be checked by specialist or replaced. - Aircon system to be replaced as it's out dated and not functioning. - Check and replace all electrical fittings as it's outdated. - Existing burglar guards and gate to be rubbed down and re-painted to client's spec. - Replace cracked window glazing where necessary.	



GROUND FLOOR PLAN- EXISTING
1 : 100

ELECTRICAL LEGEND

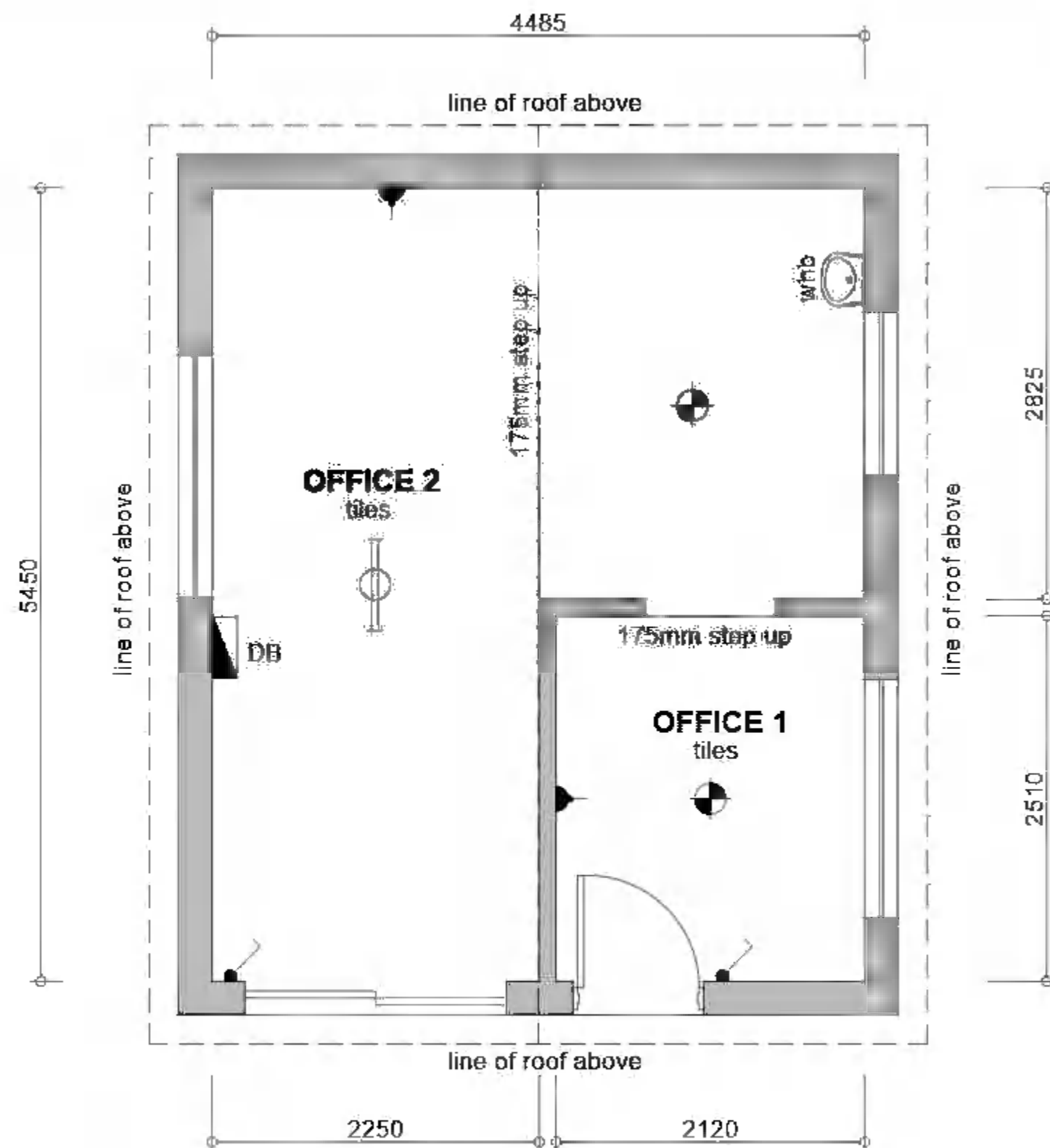
Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

EXISTING OFFICES, STORE & ABLUTIONS

Consent Drawing number	Drawn by	Checked by Professional Consultant
V45-05-01-011-0-SLAY-T-00	30 June 2025	NGM
		A MANGRAY





GROUND FLOOR PLAN- EXISTING
1 : 50

BUILDING REQUIREMENTS

AREA	COMMENTS	MEASUREMENTS
Roof	- Existing fibre cement roof to be waterproofed where leaking and painted. - New Fibre cement fascia to be installed. - New Fibre cement barge to be installed. - New PVC gutter with all necessary fixings. - New 75mm Ø PVC rainwater downpipe.	33.7sqm 6310mm length x2 5345mm length x2 6310mm length x2 2550mm length x2
Ceiling	Remove existing gypsum ceiling and cornices to be removed and replaced new.	25 sqm
Walls	Internal & external walls to be prepared and painted.	internal area: 55sqm external area: 55sqm
Floor	Remove existing floor tiles and replace with new.	25sqm
Door	Front timber door & frame to be replaced due to weathering.	
Plumbing	Ex. WHB trap to be replaced with COBRA BOTTLE TRAP 340 OR equal approve product.	quantity : 1
General	- Fire extinguish to be checked by specialist or replaced. - Aircon system to be replaced as it's out dated and not functioning. - Check and replace all electrical fittings as it's outdated. - Existing burger guards and gate to be rubbed down and re-painted to client's spec. - Replace cracked window glazing where necessary.	



ELECTRICAL LEGEND

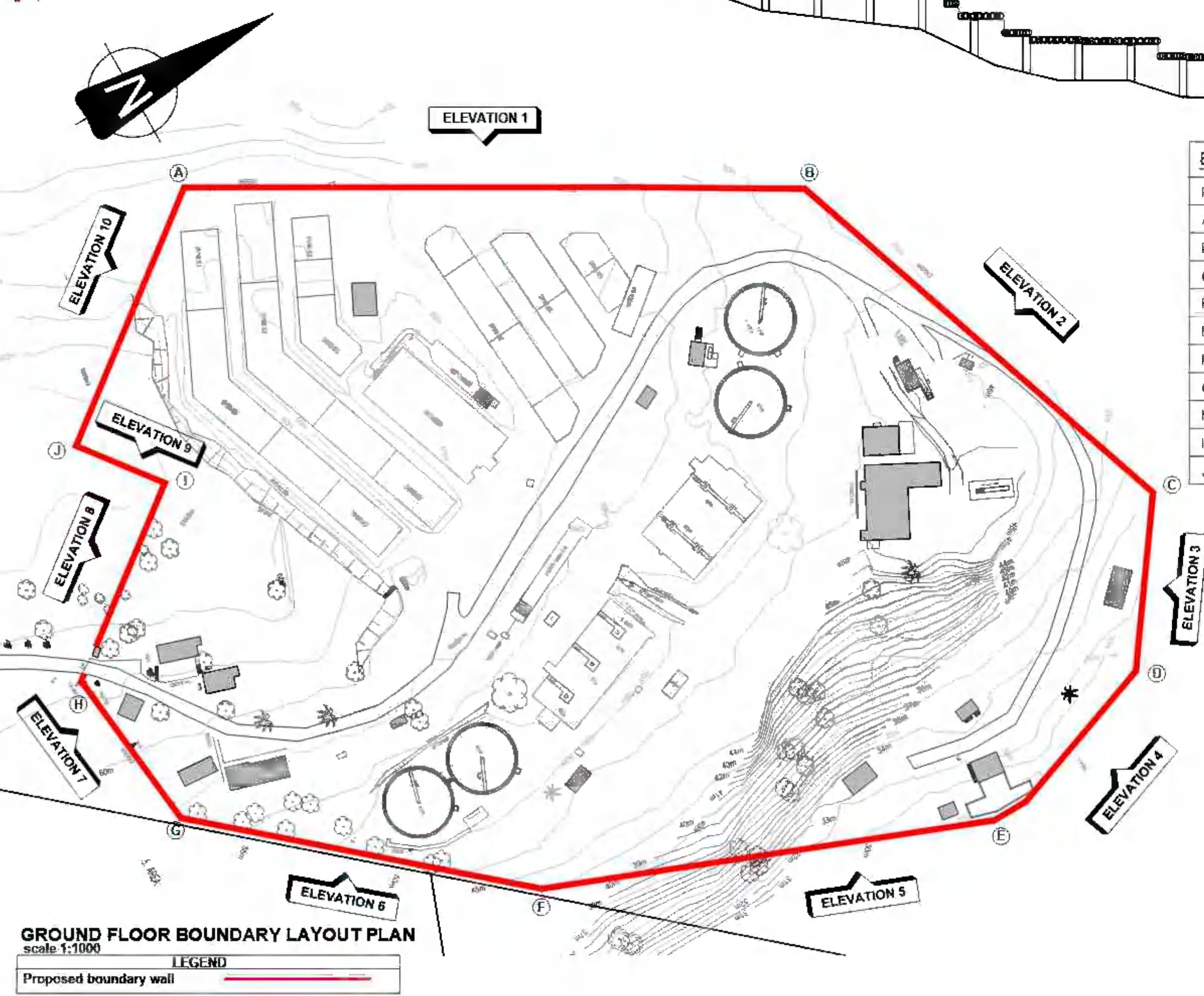
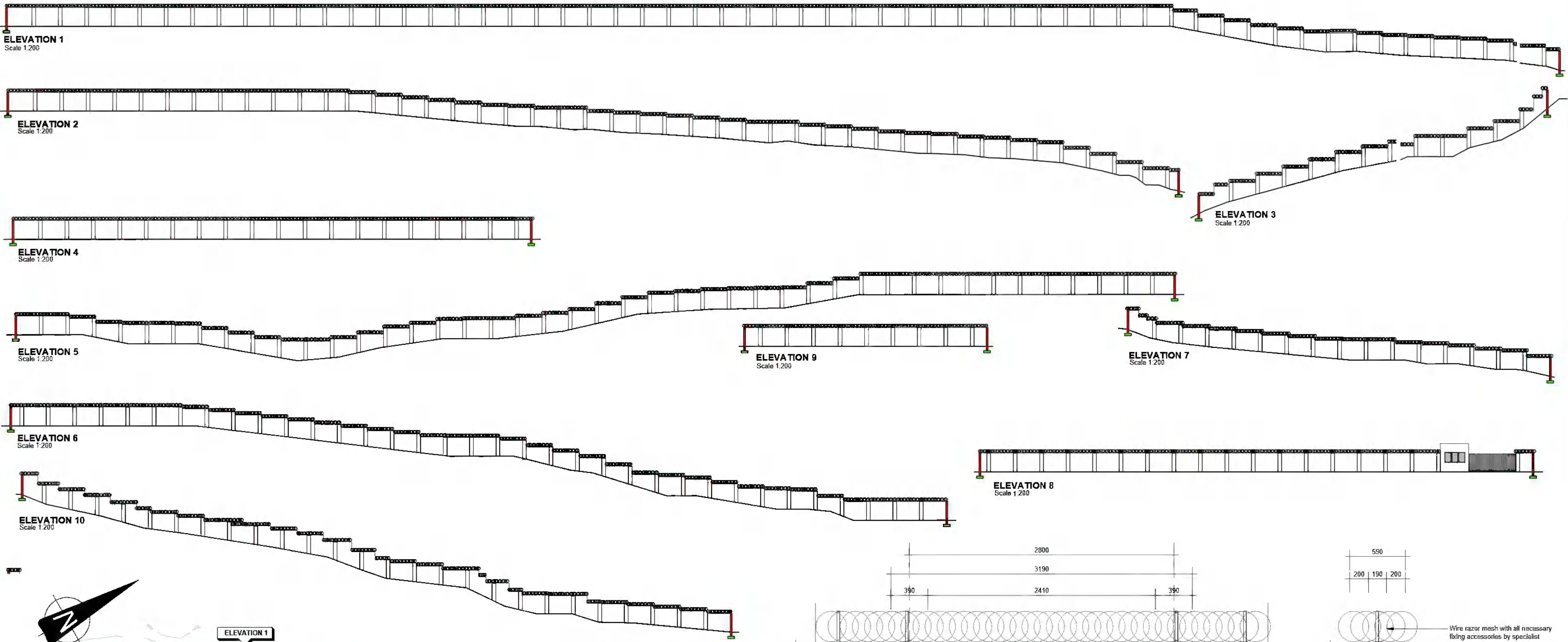
Fluorescent light	
Pendant light	
Single switched wall socket	
Light switch	
Distribution box	

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE 2)

EXISTING OFFICES 2

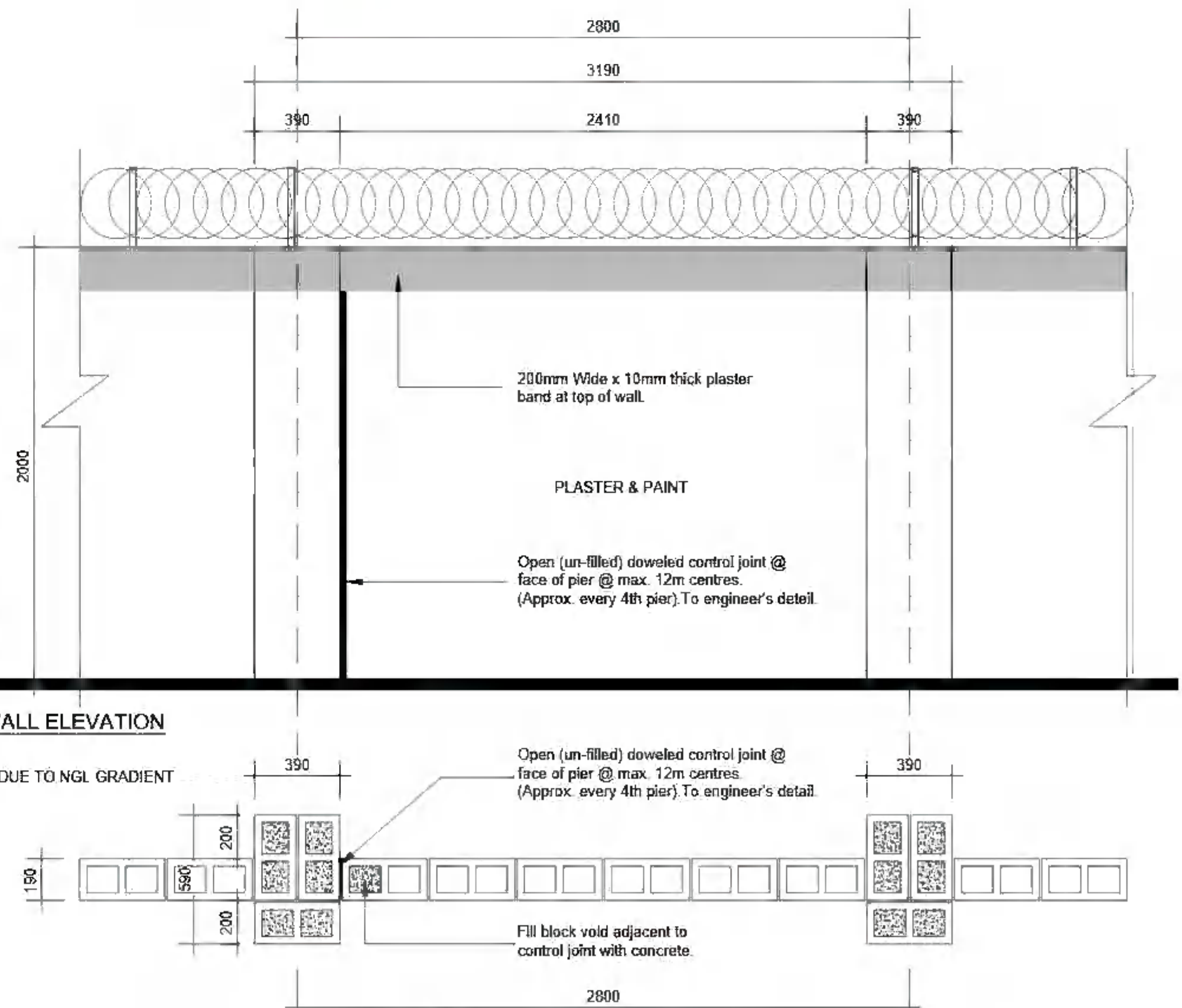
Consent Drawing number	Date	Drawn by	Checked by Professional Consultant
V45-05-01-012-EOLAY-T-00	30 June 2025	NGM	A MANGRAY



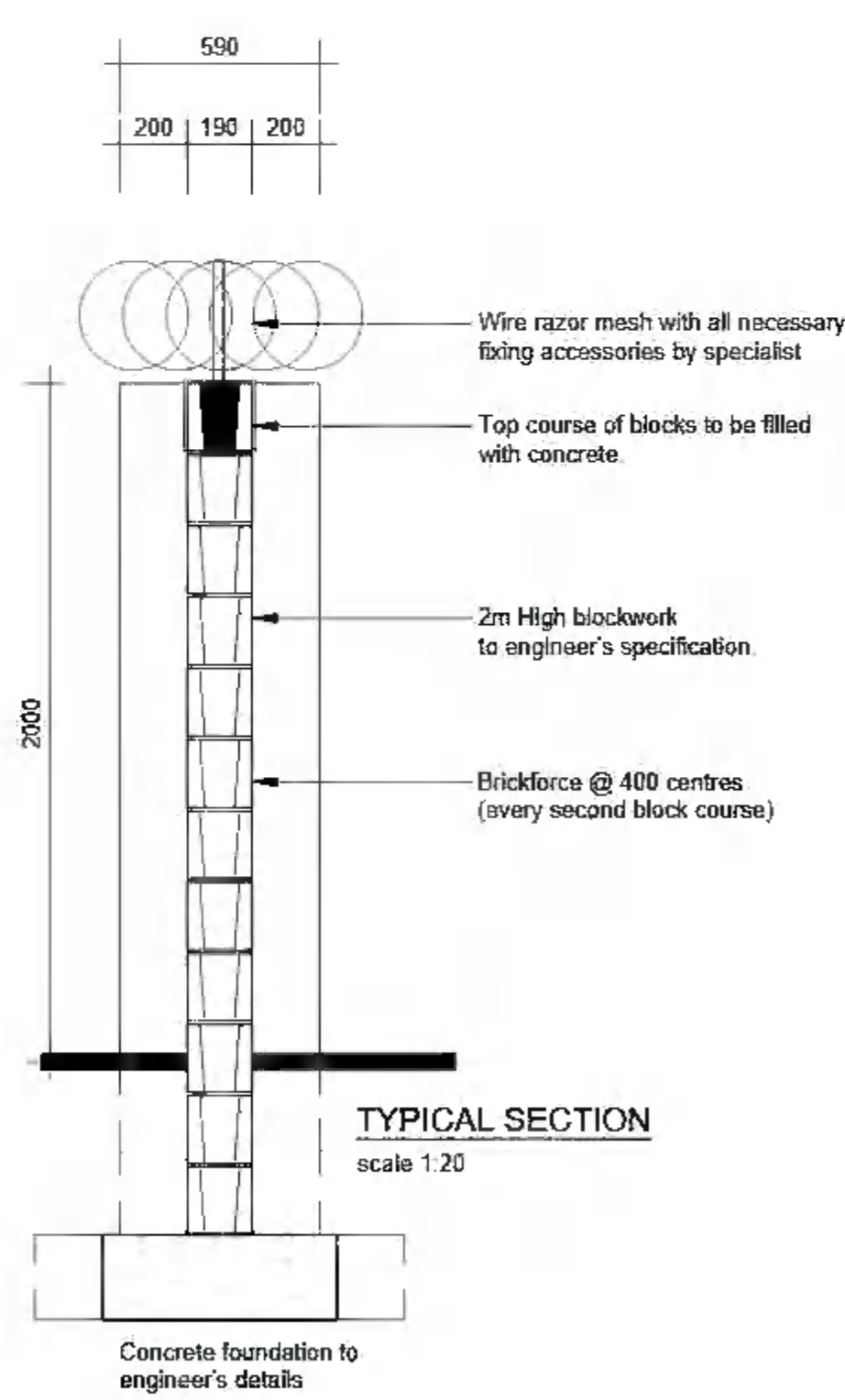


BOUNDARY WALL MEASUREMENTS	
POINT	DISTANCE
A-B	166.54m
B-C	123.91m
C-D	48.12m
D-E	56.33m
E-F	122.66m
F-G	98.52m
G-H	45.17m
H-I	57.76m
I-J	25.86m
J-A	75.14m

TYPICAL BOUNDARY WALL ELEVATION
scale 1:20
* PIER SPACING CAN VARY DUE TO NGL GRADIENT



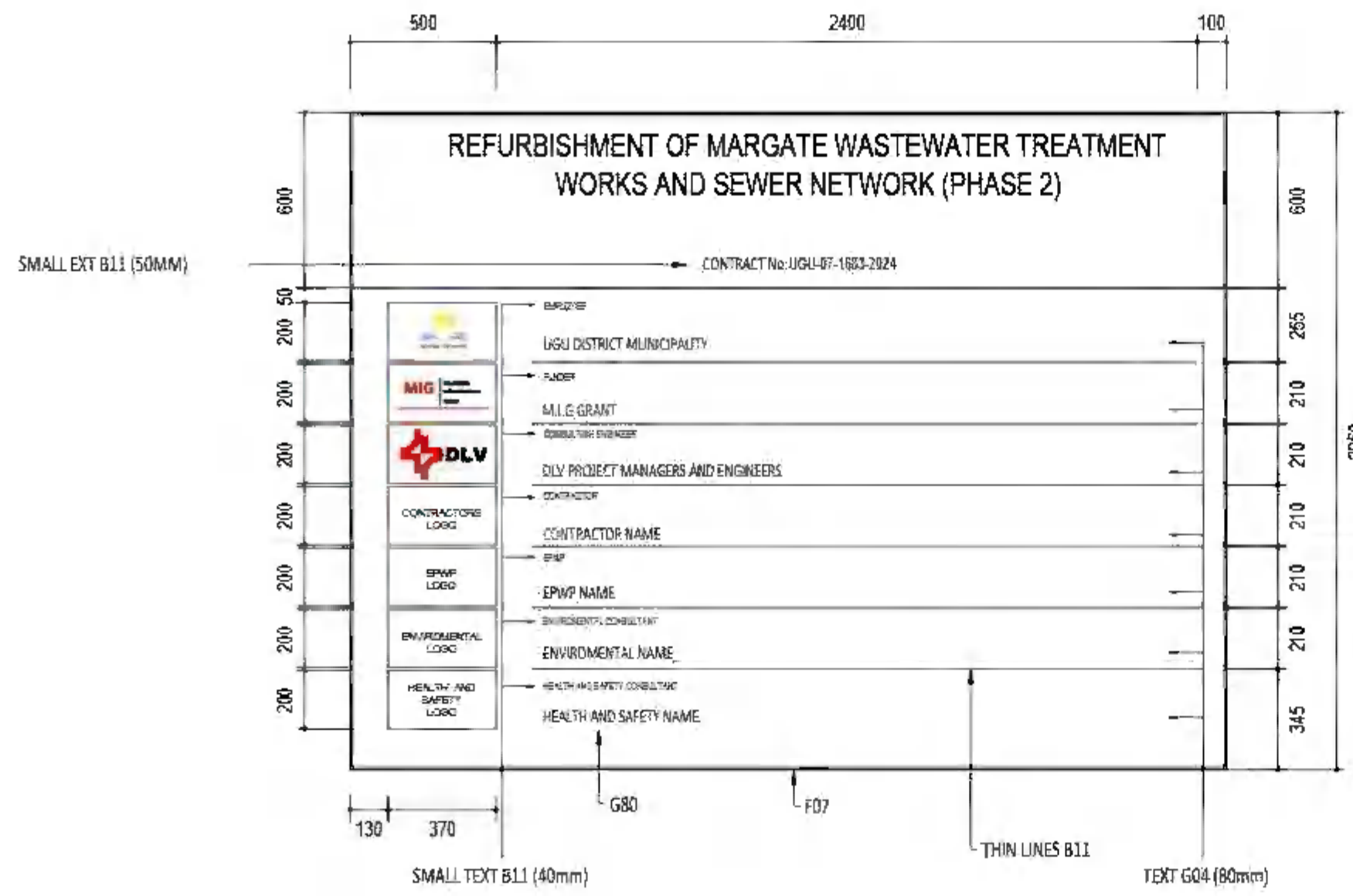
TYPICAL BOUNDARY WALL PLAN LAYOUT
scale 1:20
* PIER SPACING CAN VARY DUE TO NGL GRADIENT



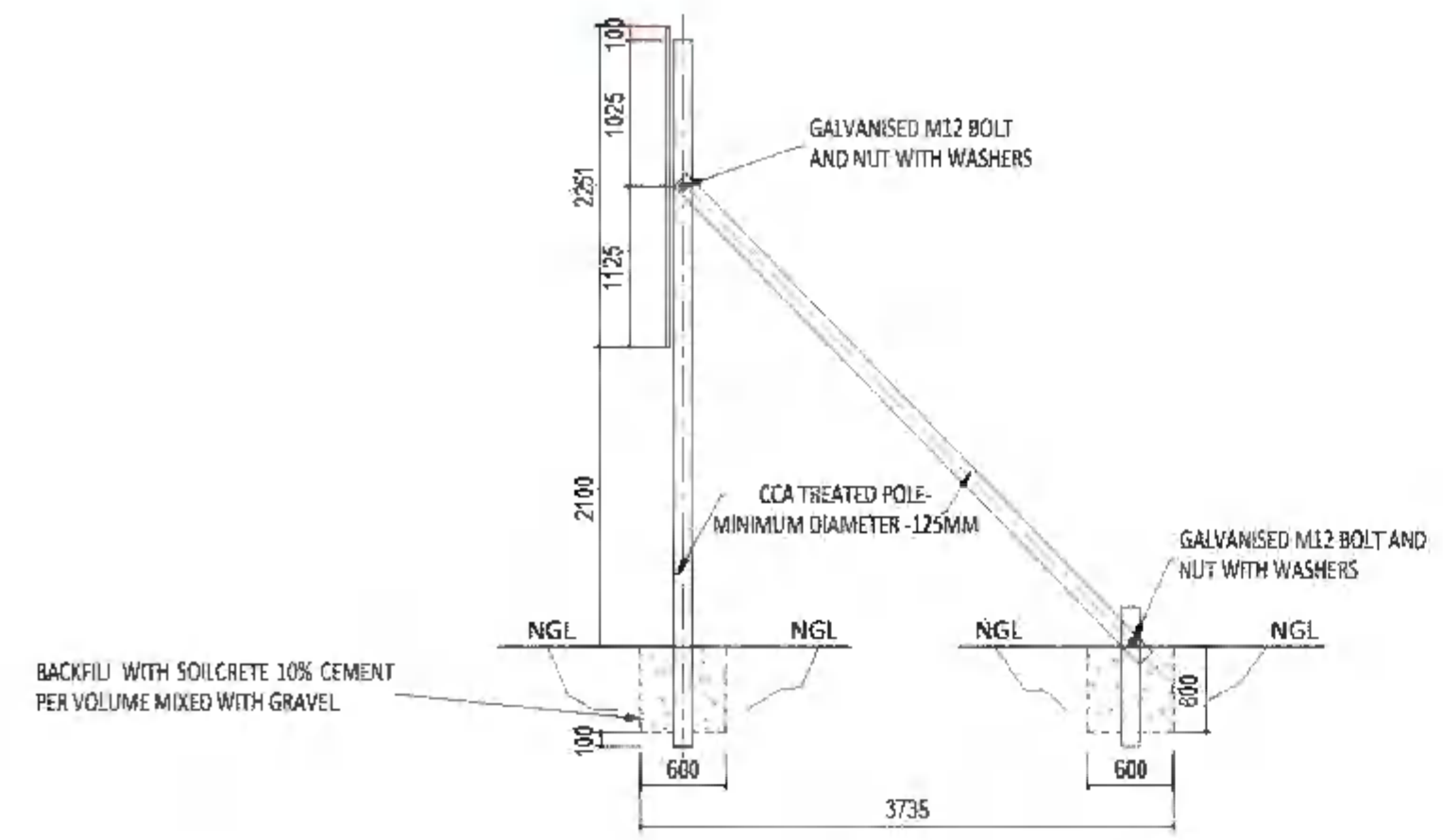
TYPICAL SECTION
scale 1:20

Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (PHASE2)			
PROPOSED NEW BOUNDARY WALL			
Contract	Date	Drawn by	Checked by Professional Consultant
V45-02-01-013-BWLAY-T-00	30 June 2025	NGM	A MANGRAY

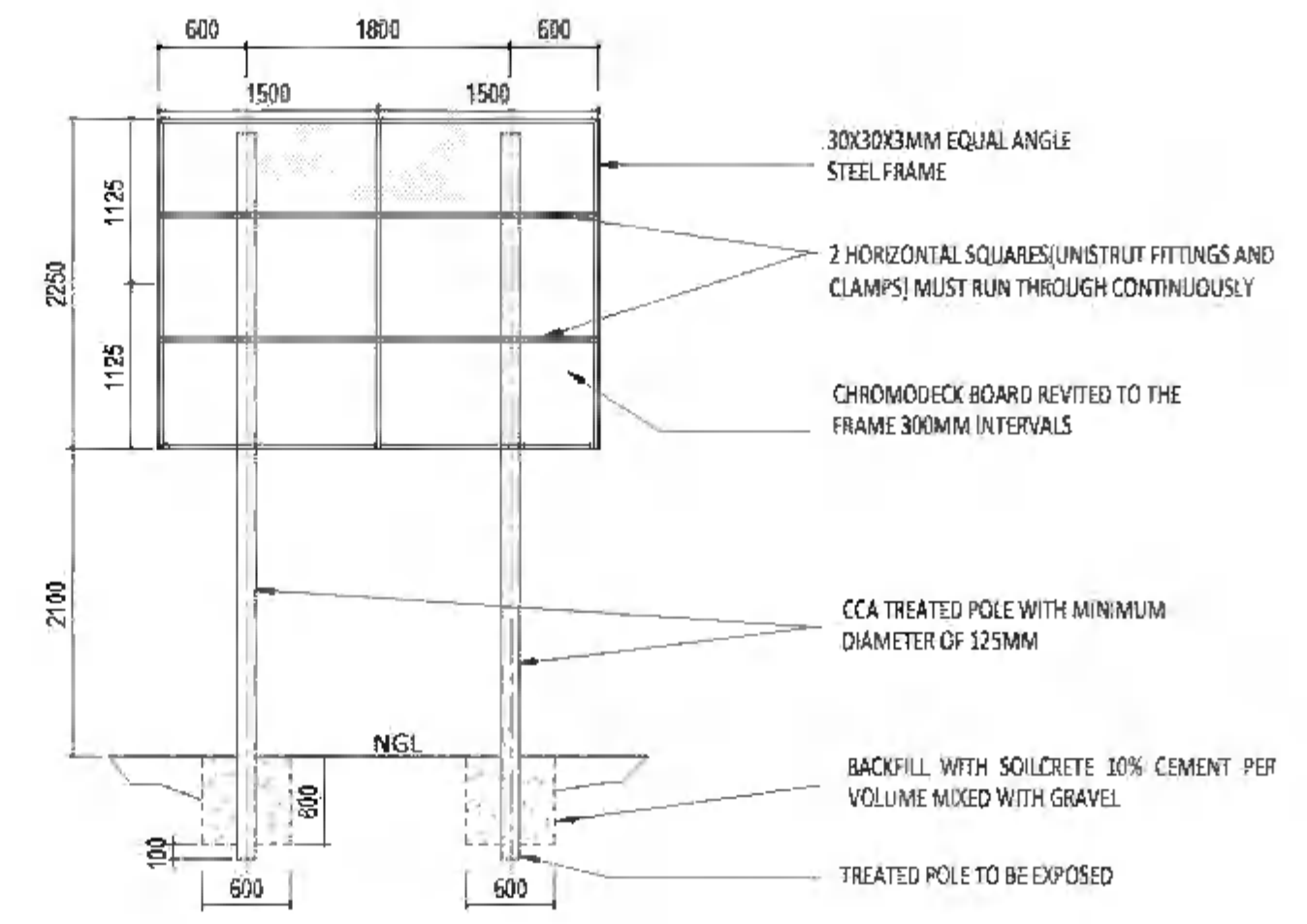
PROJECT MANAGERS & ENGINEERS
DLV
144 Mark Street, Vryheid
P.O. Box 1460
Vryheid 3100
Tel: 034 980 7242
Fax: 034 983 2765
Email: info@dlveng.co.za



NAME BOARD
SCALE 1:20



SIGN BOARD SIDE VIEW



SIGN BOARD FRONT VIEW

SIGN BOARD SUPPORT
SCALE 1:50

NOTES

- COLOURS IN ACCORDANCE WITH SANS 1051:2004
B11 - DARK EARTH
F07 - MIDDLE BLUE
G04 - BLUE GREY
G80 - CLOUD WHITE
- SUPPORTS TO BE CCA TREATED POLES WITH A MINIMUM DIAMETER OF 125mm
- SOILCRETE BACKFILL TO BE WELL COMPACTED
- ALL DIMENSIONS IN MILLIMETERS (mm) UNLESS STATED OTHERWISE
- UNISTRUT FITTINGS AND CLAMPS TO BE USED

Revisions

REV. NO	DATE	DESCRIPTION
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Checked by Professional Consultant
A. MASIKHAYI

Signature: DLV 07/09/2025

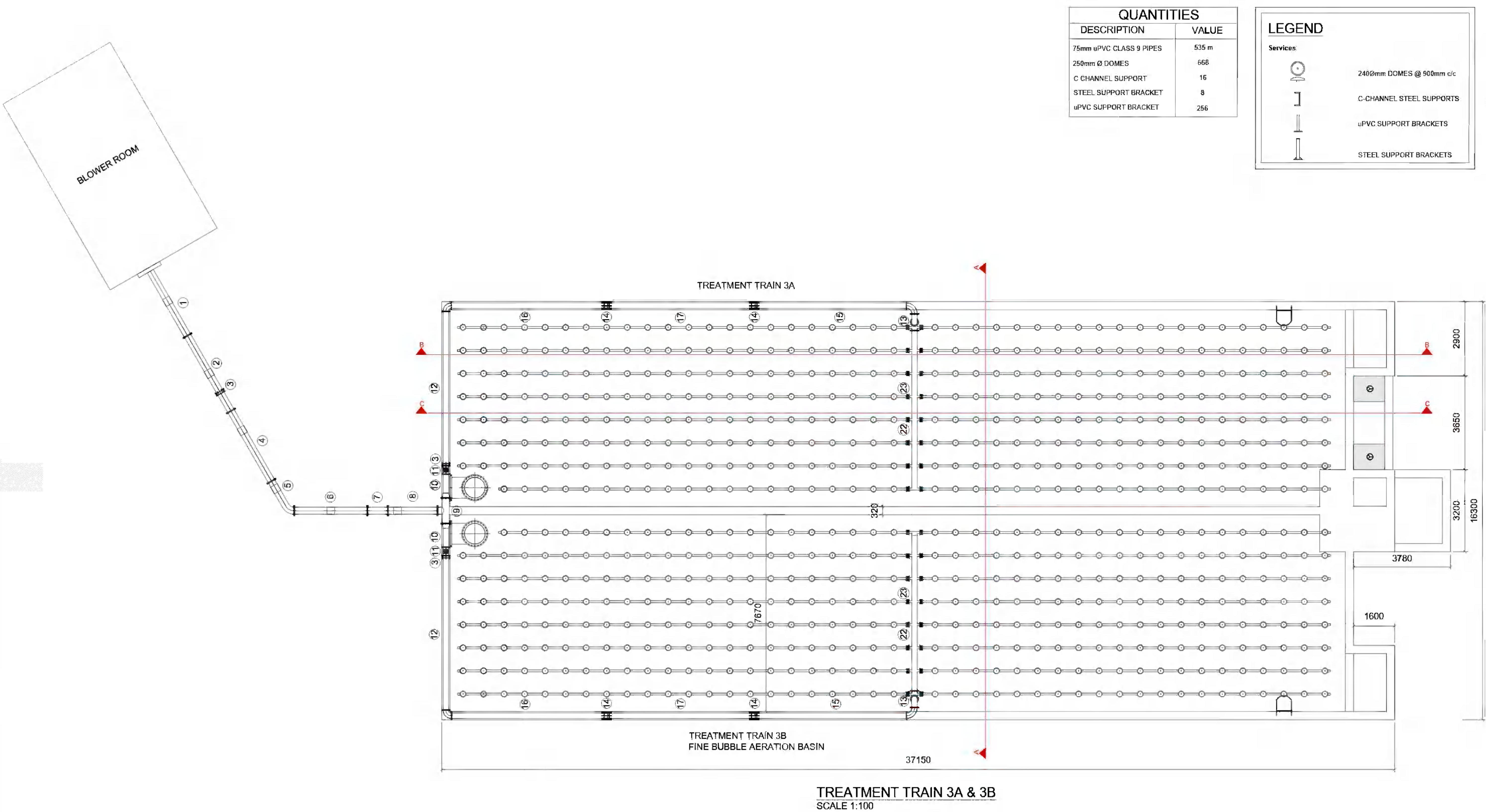
PROJECT MANAGERS & ENGINEERS
DLV
144 Mark Street Vryheid
P.O. Box 1450
Vryheid 3100
Tel: 034 980 7242
Fax: 034 983 2765
Email: info@dlveng.co.za

UGU DISTRICT MUNICIPALITY

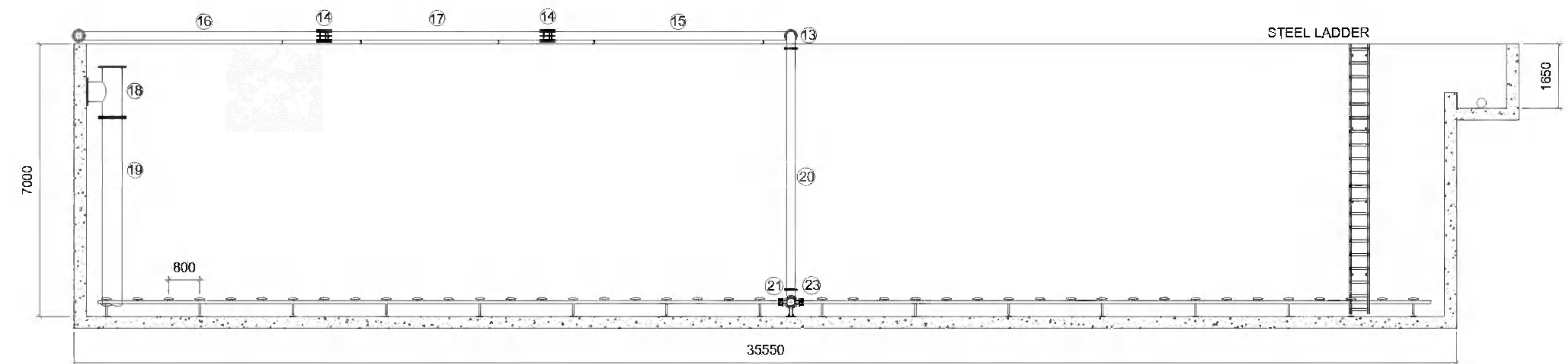
Contract:
REFURBISHMENT OF MARGATE WASTEWATER TREATMENT WORKS AND SEWER NETWORK (PHASE 2)

PROJECT SIGN BOARD

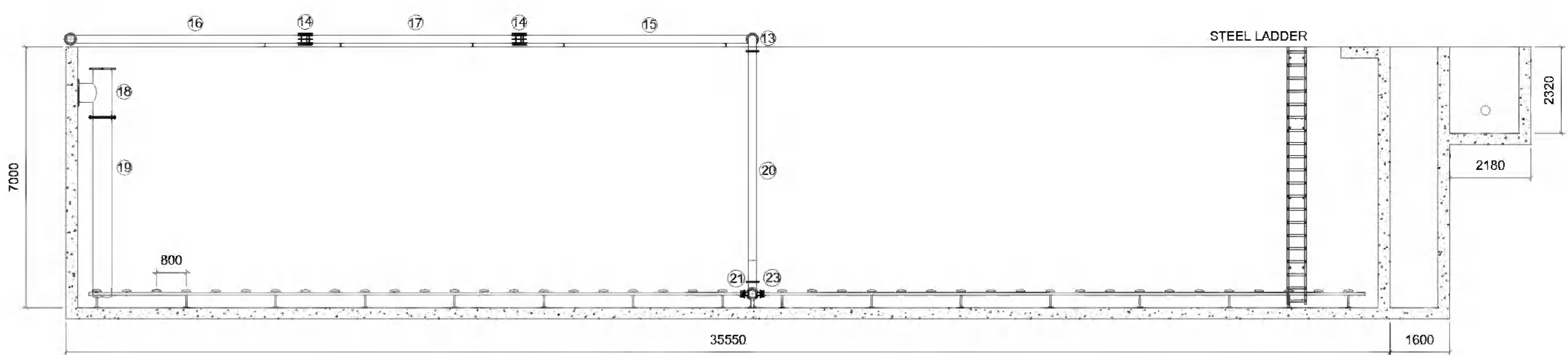
Drawn: T Mathebule	Date: September 2025
Scale: AS SHOWN	Sheet No: SHEET 1 OF 1
Consultant Drawing number: V45-06-01-015-SB-T-00	Drawing Size: A2
Client Drawing number:	



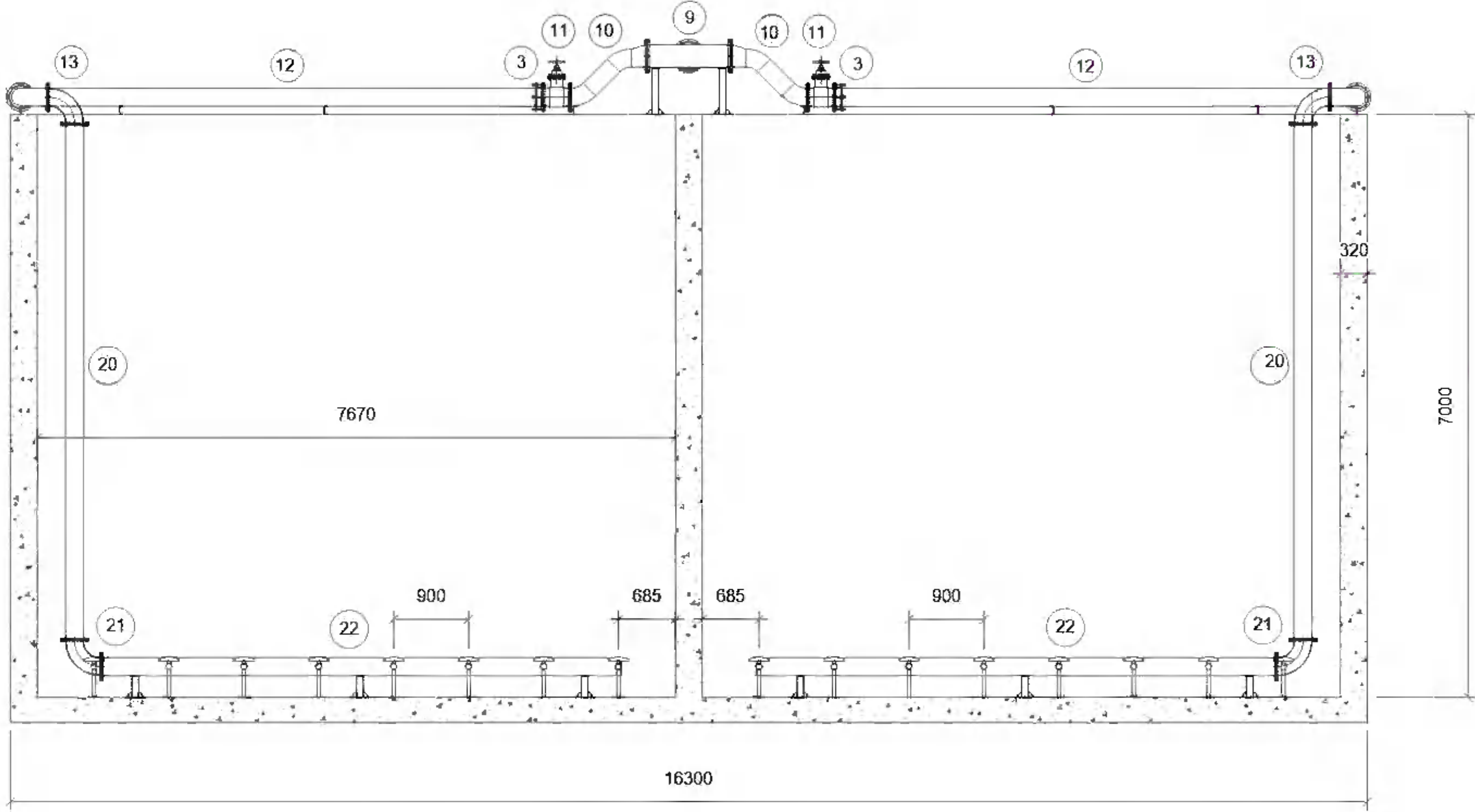
TREATMENT TRAIN 3A & 3B
SCALE 1:100



SECTION B-B
SCALE 1:100

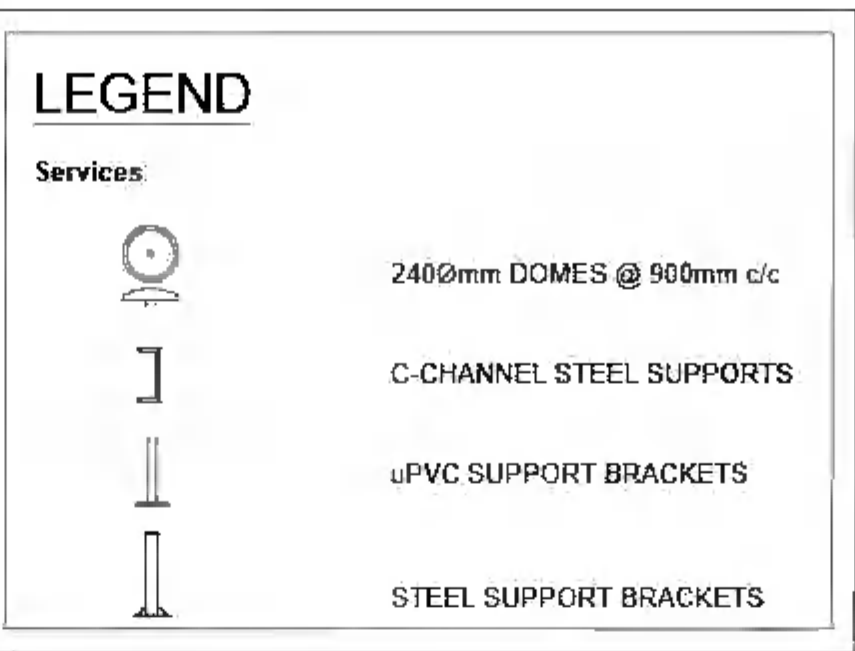


SECTION C-C
SCALE 1:100



SECTION A-A
SCALE 1:100

QUANTITIES	
DESCRIPTION	VALUE
75mm uPVC CLASS 3 PIPES	535 m
250mm Ø DOMES	668
C CHANNEL SUPPORT	16
STEEL SUPPORT BRACKET	8
uPVC SUPPORT BRACKET	256



TYPICAL PIPE FITTINGS AND ITEM LIST				
NO		NO OFF	DIMENSIONS	STATUS
1	250mmØ x200mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	1	2900	EXISTING
2	250mmØ x334mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	1	3340	EXISTING
3	250mmØ FLANGE ADAPTOR OR SIMILAR APPROVED, BOTH ENDS FLANGED TO SABS 1123-18003	3		EXISTING
4	250mmØ x334mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	1	3160	EXISTING
5	250mmØx150mm LONG RADIUS BEND ONE FLANGED AND 250mmØ x150 STRAIGHT PIPE WELDED: SABS 1123-18003	1	120°	EXISTING
6	250mmØ x250mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	1	2850	EXISTING
7	250mmØ x 45 ° LONG RADIUS S BEND, BOTH ENDS FLANGED TO SABS 1123-18003	1	800	EXISTING
8	250mmØ x1950mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	1	1950	EXISTING
9	DN250mm EQUAL "TEE" Flanged to SANS 1123 T1600-3	1	1650	EXISTING
10	250mmØ 250mmØ ECCENTRIC TAPER REDUCER PIPE 250mmØ x 45 ° LONG RADIUS S BEND, BOTH ENDS FLANGED TO SABS 1123-18003	2	205	EXISTING
11	DN200mmØ ISOLATION Valve Flanged to SANS 1123 T1600-3	2	6400	EXISTING
12	200mmØ xØ400mm LONG STEEL PIPE AND 200mmØ x 90 ° LONG RADIUS BEND, BOTH ENDS FLANGED TO SABS 1123-18003	2		EXISTING
13	200mmØ x 90 ° LONG RADIUS BEND, BOTH ENDS FLANGED TO SABS 1123-18003	2		EXISTING
14	200mmØ 1/2 DISMANTLING JOINT OR SIMILAR APPROVED, BOTH ENDS FLANGED TO SABS 1123-18003	4		EXISTING
15	200mmØ xØ220mm LONG STEEL PIPE AND 200mmØ x 90 ° LONG RADIUS BEND, BOTH ENDS FLANGED TO SABS 1123-18003	2	6250	EXISTING
16	200mmØ xØ1950mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	2	5950	EXISTING
17	200mmØ xØ750mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	2	5750	EXISTING
18	DN500mm EQUAL "TEE" Flanged to SANS 1123 T1600-3	2		EXISTING
19	500mmØ xØ500mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	2	4850	EXISTING
20	200mmØ xØ500mm LONG STEEL PIPE, BOTH ENDS FLANGED TO SABS 1123-18003	2	5250	EXISTING
21	200mmØ x 90 ° LONG RADIUS BEND WITH WELDED 75mmØ ON BOTH SIDES, BOTH ENDS FLANGED TO SABS 1123-18003	2		EXISTING
22	200mmØ x xØ550mm LONG STEEL PIPE WITH WELDED 75mmØ ALONG BOTH SIDES, BOTH ENDS FLANGED TO SABS 1123-18003	2		EXISTING
23	75mmØ FLANGE ADAPTOR OR SIMILAR APPROVED, BOTH ENDS FLANGED TO SABS 1123-18003	32		EXISTING

NOTES

REV. NO. DATE DESCRIPTION

CLIENT DEPARTMENT SIGNATURES

APPROVED BY

SIGNATURE

Checked by Professional Consultant

Signature: Date:

Consultant



DLV
PROJECT MANAGERS
AND ENGINEERS (Pty) Ltd

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Fax :034 983 2765
Email :info@dlveng.co.za



UGU DISTRICT MUNICIPALITY
Ugu District Municipality

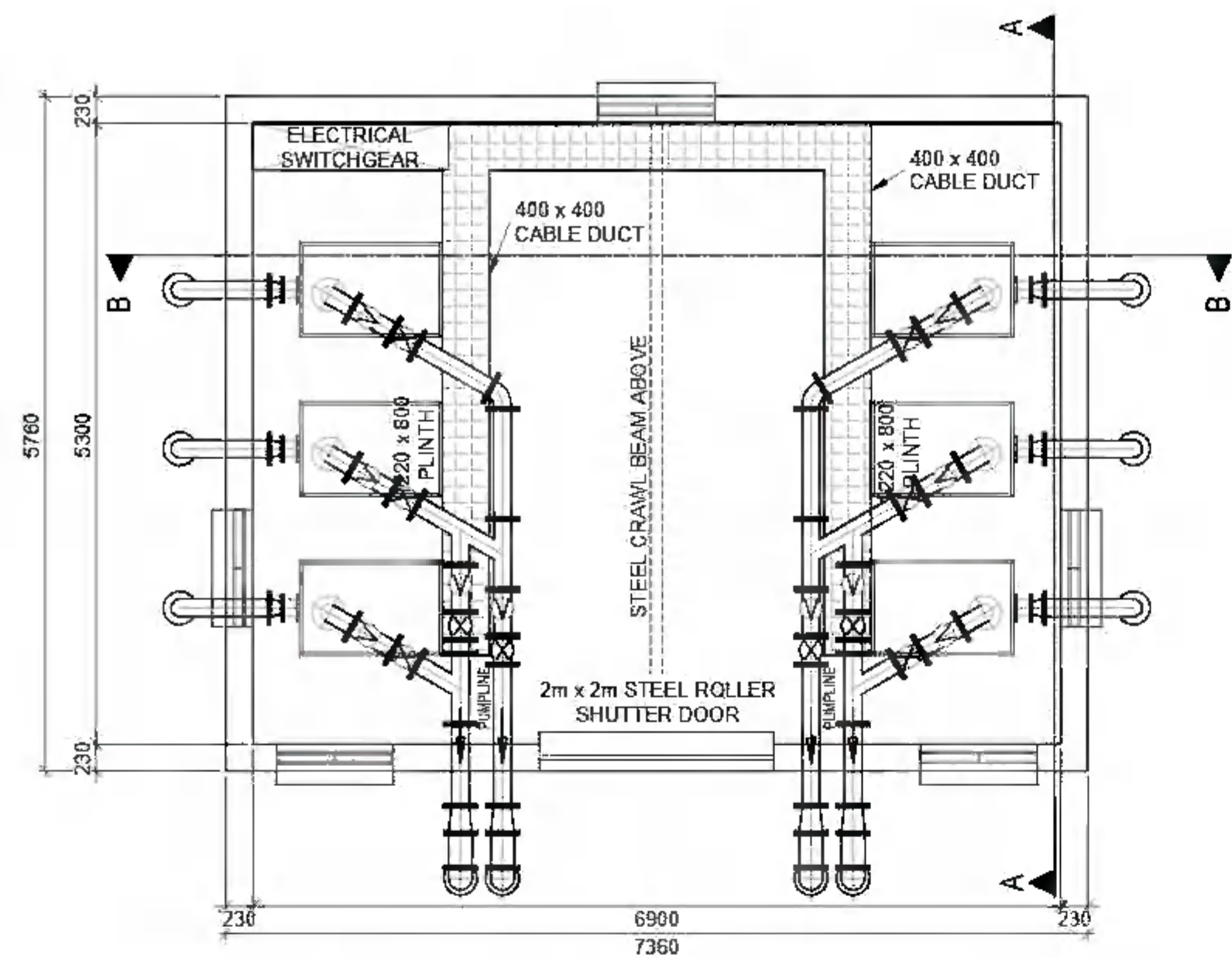
Project
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)

Drawing description

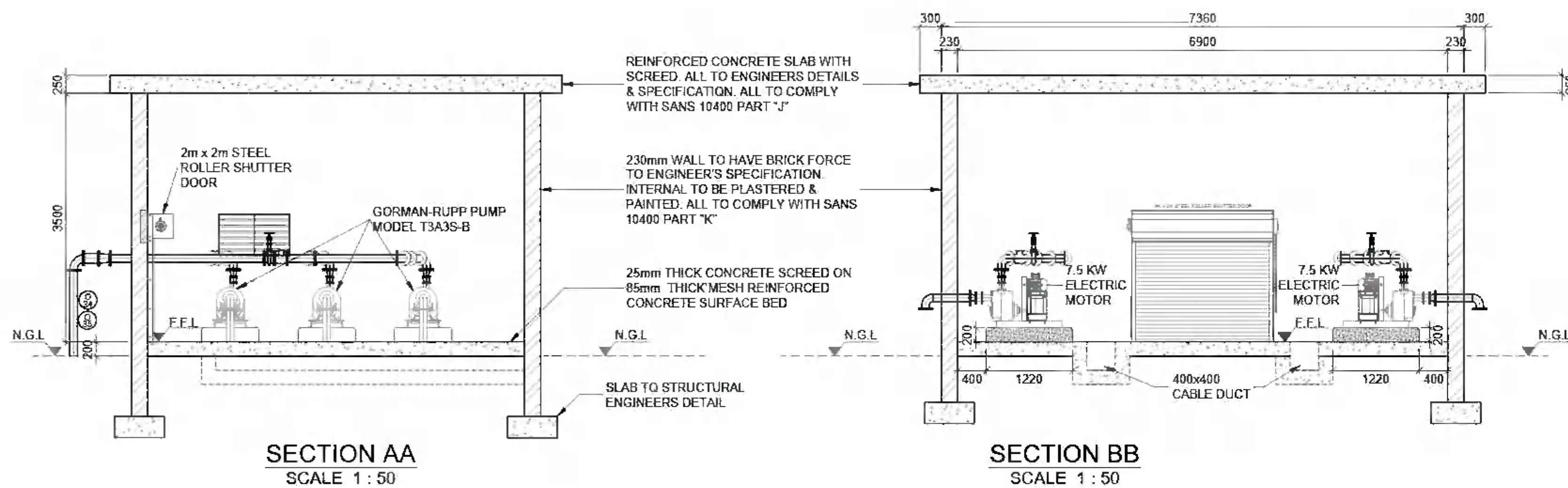
EXISTING PIPE WORK TO TREATMENT TRAIN 3

Drawn: J RAMGHULAM	Date: AUGUST 2026
Scale(s): AS SHOWN	Sheet No.: SHEET 1 OF 1
Consultant Drawing number V45-06-03-000-TT-LAY-T-00	Drawing Size A0
Client Drawing number	

TENDER DRAWING

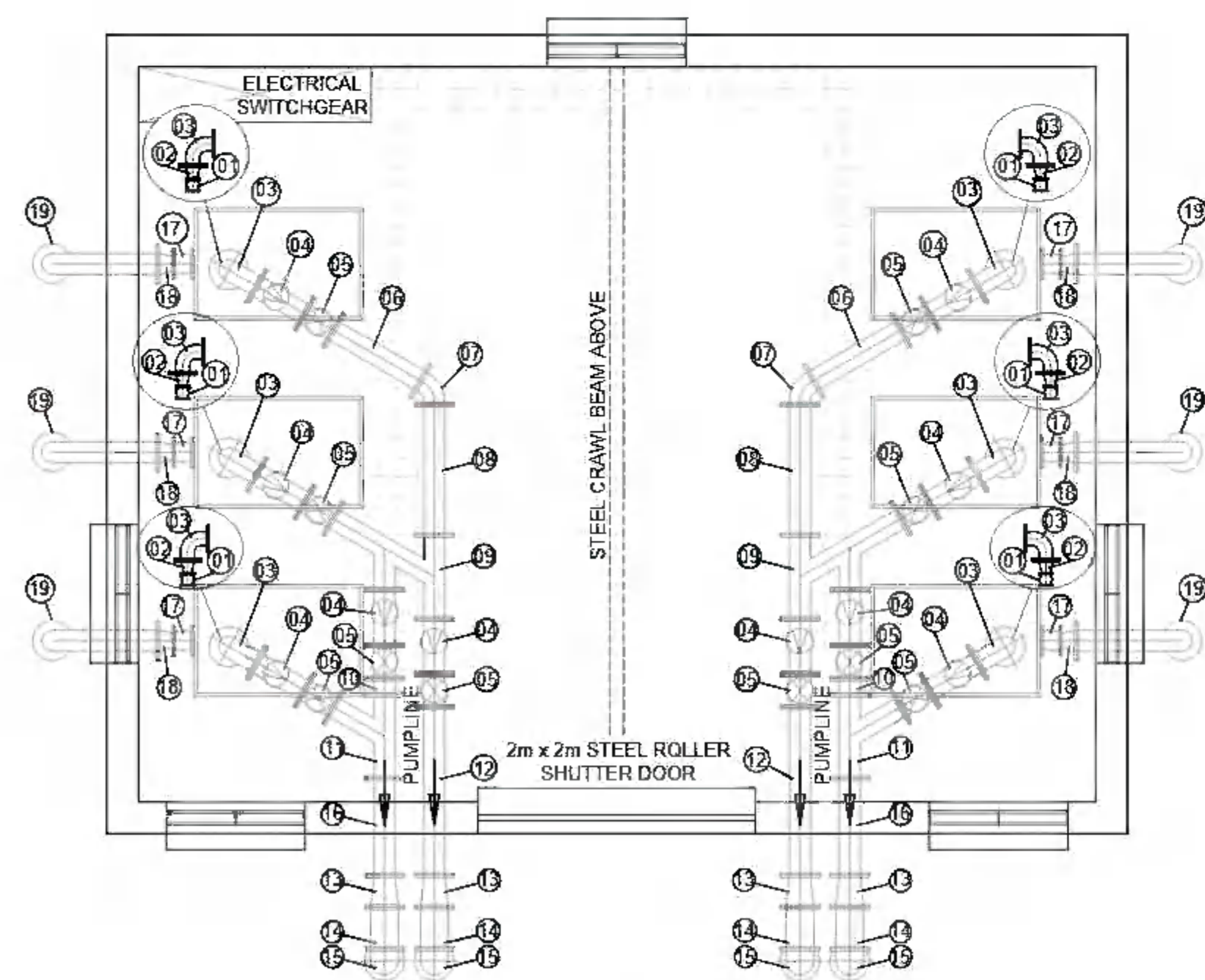


PUMP STATION A FLOOR LAYOUT PLAN
SCALE 1 : 50

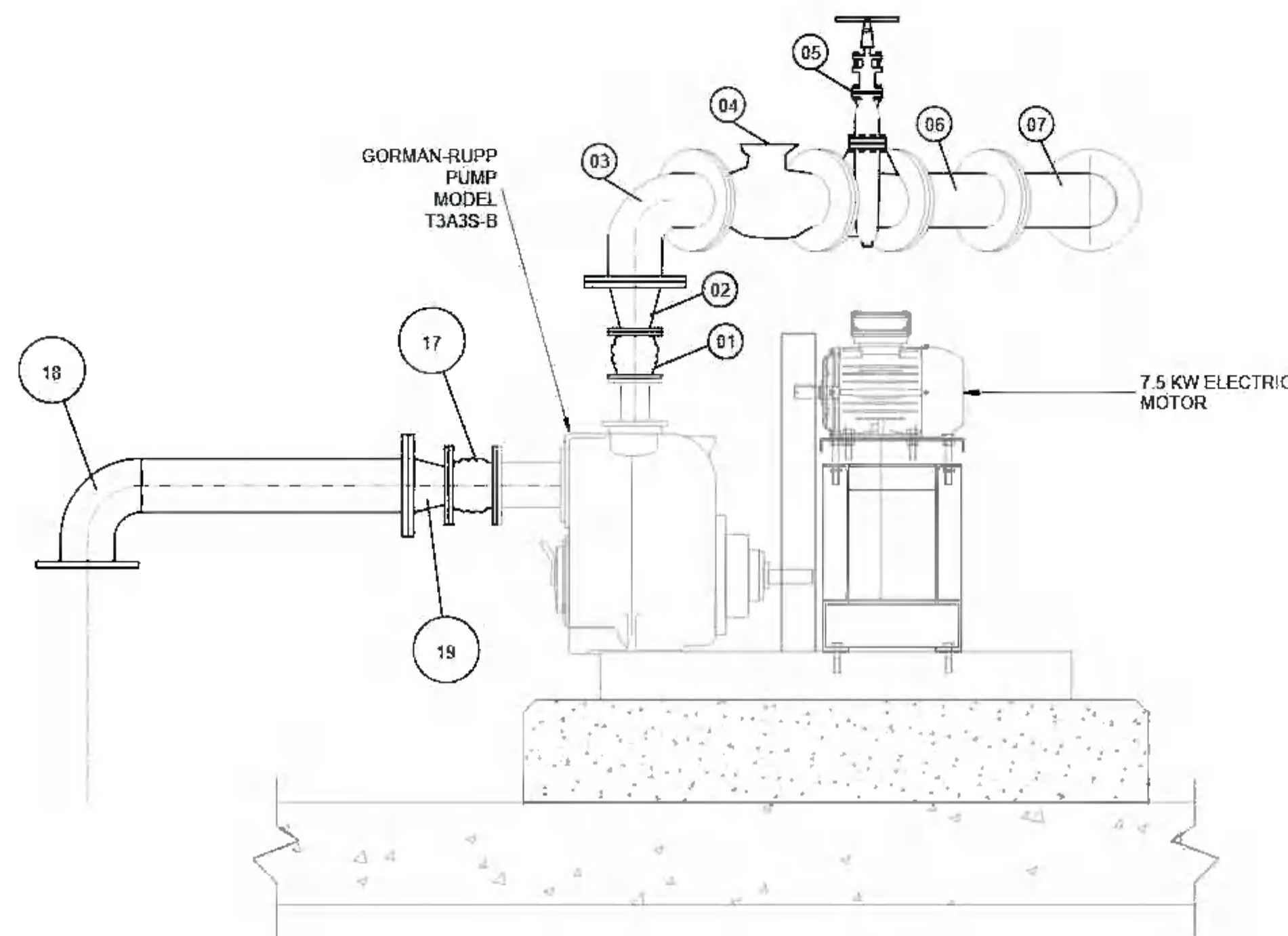


SECTION AA
SCALE 1 : 50

SECTION BB
SCALE 1 : 50



PUMP OUTLET PIPING
SCALE 1 : 40



SUCTION PIPE
SCALE 1 : 10

01 6 off REQUIRED Ø80mm FLEXIBLE COUPLING STANDARD	02 6 off REQUIRED 150/80 ECCENTRIC REDUCER STANDARD	03 6 off REQUIRED Ø150 90° BEND STANDARD
11 2 off REQUIRED SPECIAL TEE	09 2 off REQUIRED SPECIAL CONNECTOR	
04 10 off REQUIRED Ø150 NON-RETURN VALVE STANDARD	05 10 off REQUIRED Ø150 GATE VALVE STANDARD	06 2 off REQUIRED Ø150 FLANGED PIPE
07 3 off REQUIRED Ø150 60° ELBOW SPECIAL	08 2 off REQUIRED Ø150 FLANGED PIPE	10 2 off REQUIRED Ø150 FLANGED PIPE
12 2 off REQUIRED Ø150 FLANGED PIPE	13 4 off REQUIRED 200/150 ECCENTRIC REDUCER STANDARD	14 4 off REQUIRED Ø200 FLANGED PIPE
15 4 off REQUIRED Ø200 90° BEND STANDARD	16 2 off REQUIRED Ø150 FLANGED PIPE	17 6 off REQUIRED Ø80mm FLEXIBLE COUPLING STANDARD
18 6 off REQUIRED 150/80 ECCENTRIC REDUCER STANDARD	19 6 off REQUIRED Ø150 90° BEND WELDED TO PIPE STANDARD	

NOTES AND SPECIFICATIONS

- GENERAL**
1. ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SABS REQUIREMENTS.
 2. ALL DIMENSIONS ARE IN MILLIMETERS, (UNLESS OTHERWISE SPECIFIED)
 3. DO NOT SCALE FROM THESE DRAWINGS.
 4. ALL DIMENSIONS MUST BE CHECKED AND APPROVED ON SITE.
 5. ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS, SERIES 4, THIRD EDITION 2005 AND THE STANDARD CTMM DETAIL DRAWINGS.
 6. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE ARCHITECTS DRAWINGS, (IF APPLICABLE).
 7. THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS, SERIES 4.
 8. THE SIGNATURE OR INITIALS ON THIS DRAWING, OF ANY MANAGER OF THE TRANSPORT DEPARTMENT, IN NO WAY REMOVES ANY RESPONSIBILITY WHATSOEVER FROM THE CONSULTANT.
 9. THE CONSULTANT REMAINS RESPONSIBLE TO ENSURE THAT ALL THE GUIDELINES, STANDARD DRAWINGS, STANDARDS AND SPECIFICATIONS OF THE TRANSPORT DEPARTMENT HAVE BEEN MET AND ARE COMPLIED WITH.
 10. FINAL POSITION OF SERVICES TO BE DETERMINED ON SITE.

LEGEND

REV. NO. DATE DESCRIPTION

CLIENT DEPARTMENT SIGNATURES

APPROVED BY

SIGNATURE

Checked by Professional Consultant

Signature: _____ Date: _____

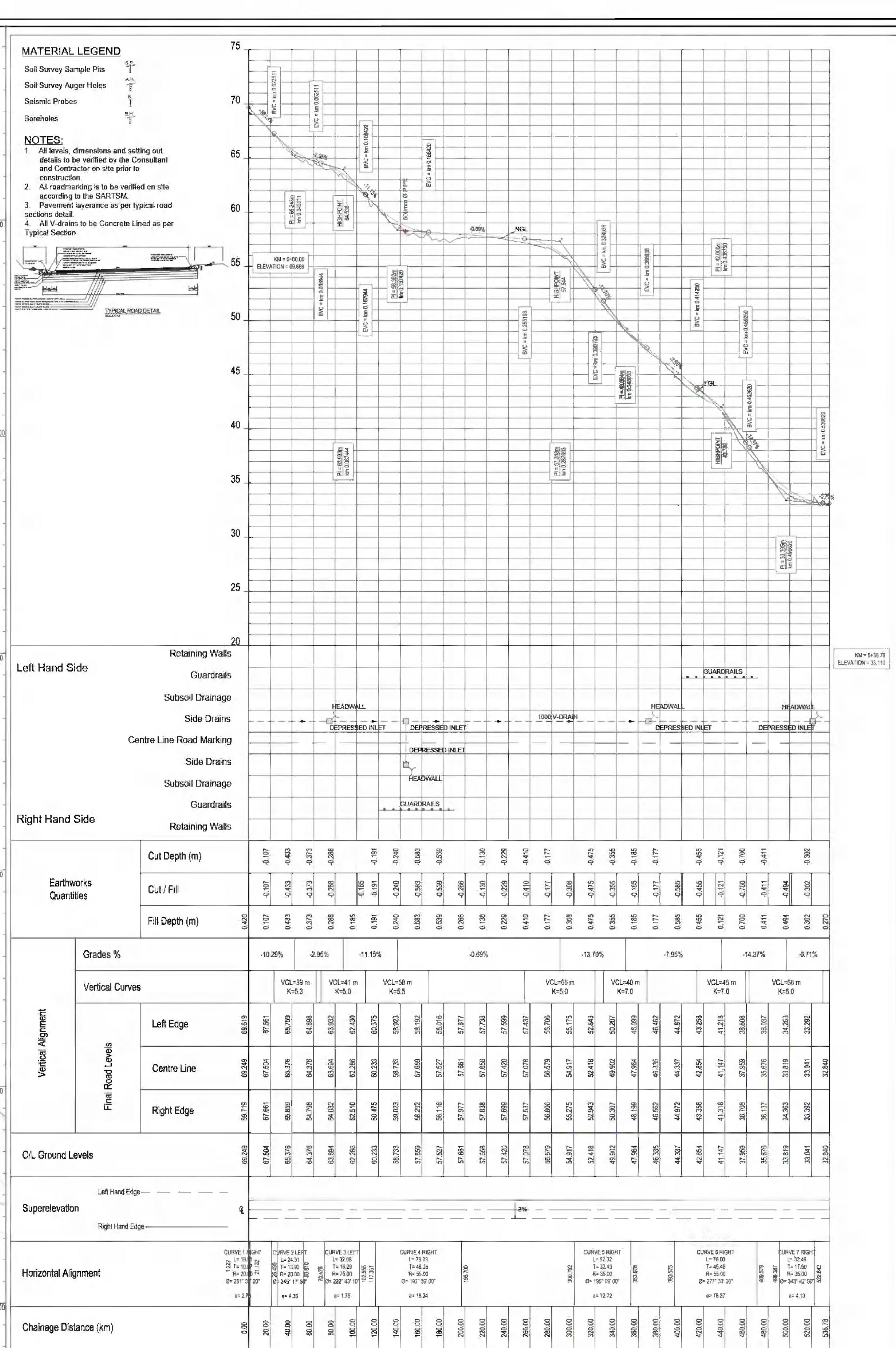
Consultant



Project
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)

Drawing description
SLUDGE RE-CIRCULATION PS LAYOUT AND DETAILS

Drawn: **T MATHIBULE** Date: **AUGUST 2026**
Scale(s): _____ Sheet No.: _____
AS SHOWN Sheet **1 OF 1**
Consultant Drawing number: **V45-06-03-001-RA SLAY-T-00** Drawing Size: **A1**
Client Drawing number: _____



PROPOSED ROAD REDUCTION TO 4m

FROM m	TO m	LENGTH (m)
96.000	106.00	10m

1000 WIDE OPEN CHANNEL
TO FALL TO STORMWATER
REIN' WITH RE# 100 MESH
CONSTRUCTION JOINTS 2.5M MAX.

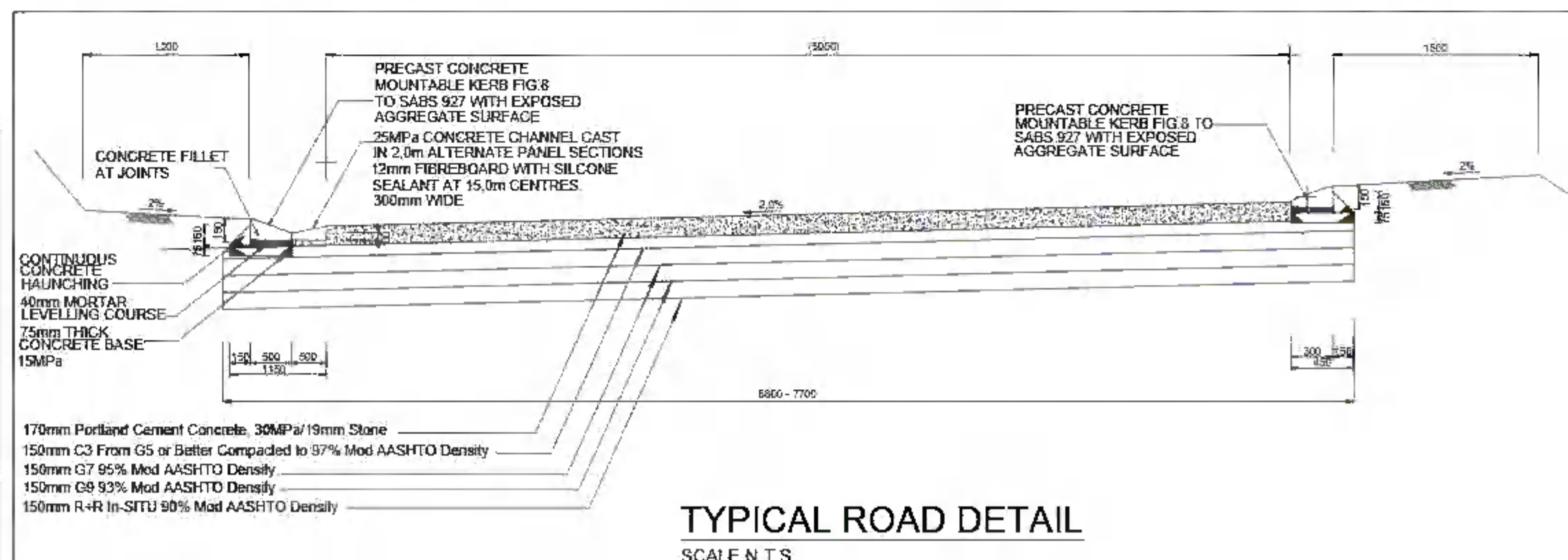
15 MPa CONCRETE BEDDING

1000

**TYPICAL STORMWATER CHANNEL
DETAIL**

SCALE 1:10

Setting out Coordinates Turning Point Lo 31		
Point	Y Coordinate	X Coordinate
T1	60699.979	3414547.506
T2	60701.763	3414557.445
T3	60682.084	3414561.021
T4	60680.289	3414551.174

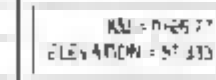


NOTES		
1. CLEAR AND REMOVE ALL DEBRIS UNMARKED TREES GRASS AND RUBBLE FROM PLATFORM AREA TREES MARKED BY LANDSCAPE ARCHITECT TO BE RETAINED.		
2. EXCAVATE TO SPOIL ALL TOPSOIL EXCEPT THAT REQUIRED FOR LANDSCAPING WHICH MUST BE STOCKPILED AS DIRECTED BY THE LANDSCAPE ARCHITECT.		
3. CONSTRUCT FINISHED ROAD TO LEVELS SHOWN.		
4. DURING CONSTRUCTION STORMWATER RUNOFF MUST BE CONTROLLED TO PREVENT DAMAGE TO THE WORKS AND TO EXISTING STRUCTURES.		
5. ALL SLOPE BANKS TO BE 1:2 IF THE EMBANKMENT SLOPE OF 1:2 CANNOT BE SAFELY CONSTRUCTED THE REVISED SLOPES MUST BE AGREED ON BY THE ENGINEER ON SITE.		
6. ALL EARTHWORKS TO BE IN ACCORDANCE WITH SAHS 1200 / CDDO SPECIFICATION.		
7. ALL COMPACTION TESTS REQUIRED AS PER ENGINEERS SPECIFICATION.		
8. THE CONTOURS AND NATURAL GROUND LEVELS INDICATED ON THIS DRAWING ARE AS PER THE SURVEY DATA SUPPLIED. THE CONTRACTOR IS TO CHECK THE ACCURACY OF THIS INFORMATION AND REPORT ANY DISCREPANCIES IMMEDIATELY.		
9. ALLOWANCE TO BE MADE FOR SHORING VERTICAL EXCAVATIONS.		
10. THE CONTRACTOR TO ALLOW FOR EROSION PROTECTION AND MAINTENANCE TO ALL EMBANKMENTS DURING THE DURATION OF THE CONTRACT.		
11. SETTING OUT COORDINATES ARE IN THE WGS84 Ld 33 COORDINATE SYSTEM. WG84 = UTM WG84 = Systems Surveyor uses to measure		
12. THE CONTRACTOR WILL BE SUPPLIED WITH BENCHMARK INFORMATION BEFORE CONSTRUCTION COMMENCES		
13. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING AND PROTECTING ALL EXISTING SERVICES ON THE SITE.		
14. ALL BELLMOUTH INTERSECTIONS TO BE CONSTRUCTED WITH SHOWN RADII, AS PER KZN DOT TYPE B3 ACCESS.		
15. ALL STORMWATER PIPE CROSSINGS TO BE DETERMINED ON SITE BY THE ENGINEER. 450mm/600mm Ø CONCRETE SPOT ON SOCKET CLASS T80 TO HAVE A MINIMUM GRADE OF 1% AND MINIMAL COVER OF 900mm BELOW FINISHED ROAD LEVEL.		
16. POINTS SHOWN INDICATE FINISHED ROAD LEVEL.		
17. ALL LEVELS AND COORDINATE POINTS ARE TO BE VERIFIED AND APPROVED BY THE RESIDENT ENGINEER ON-SITE.		
18. ROADS ARE TO BE CONSTRUCTED AS PER KZN DOT TYPE TA LOCAL ROAD		
19. EARTH VIBRANTS TO BE CONSTRUCTED IN CUT AREAS ALONG THE ROAD AND WILL BE DETERMINED ON SITE BY THE ENGINEER.		
20. ENGINEER MUST CONFIRM SUITABILITY OF DESIGN ON SITE.		
REV. NO.	DATE	DESCRIPTION
CLIENT DEPARTMENT SIGNATURES		
APPROVED BY		
SIGNATURE		
Checked by Professional Consultant		
A. MANGRAY		
Signature:	February 2025 Date:	
Consultant		
 144 Mark Street P.O Box 1460 Vryheid 3100 Tel : +34 980 7242 Fax : +34 983 2765 Email : info@dlveng.co.za		
 UGU DISTRICT MUNICIPALITY		
Project		
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)		
Drawing description		
WWTW CONCRETE ACCESS ROAD LAYOUT: (0,00km to 0,537km)		
Drawn: J RAMGHULAM Scale(s): AS SHOWN	Date: AUGUST 2026 Sheet No.: Sheet 1 OF 1 Drawing Size A0	
Client Drawing number		
V45-06-05-000-RLAY-T-00		
Client Drawing number		



RM = 0.63 37
 ELEVATION = 45.79

RM = 0.63 37
 ELEVATION = 45.79

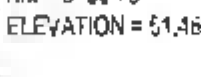


RM = 0.257* ELEVATION = 5° 33'
--

RM = 0.257* ELEVATION = 5° 33'
--

ELEVATION

ELEVATION

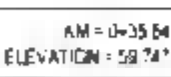
ELEVATION = 51.46

ELEVATION = 51.46



51

51



AM = 0435.64
ELEVATION = 59.74°

AM = 0435.64
ELEVATION = 59.74°

CLIENT DEPARTMENT SIGNATURES

APPROVED BY _____

APPROVED BY _____

APPROVED BY _____

APPROVED BY _____

APPROVED BY _____



APPROVED BY _____

APPROVED BY _____

APPROVED BY _____

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APPROVED BY _____

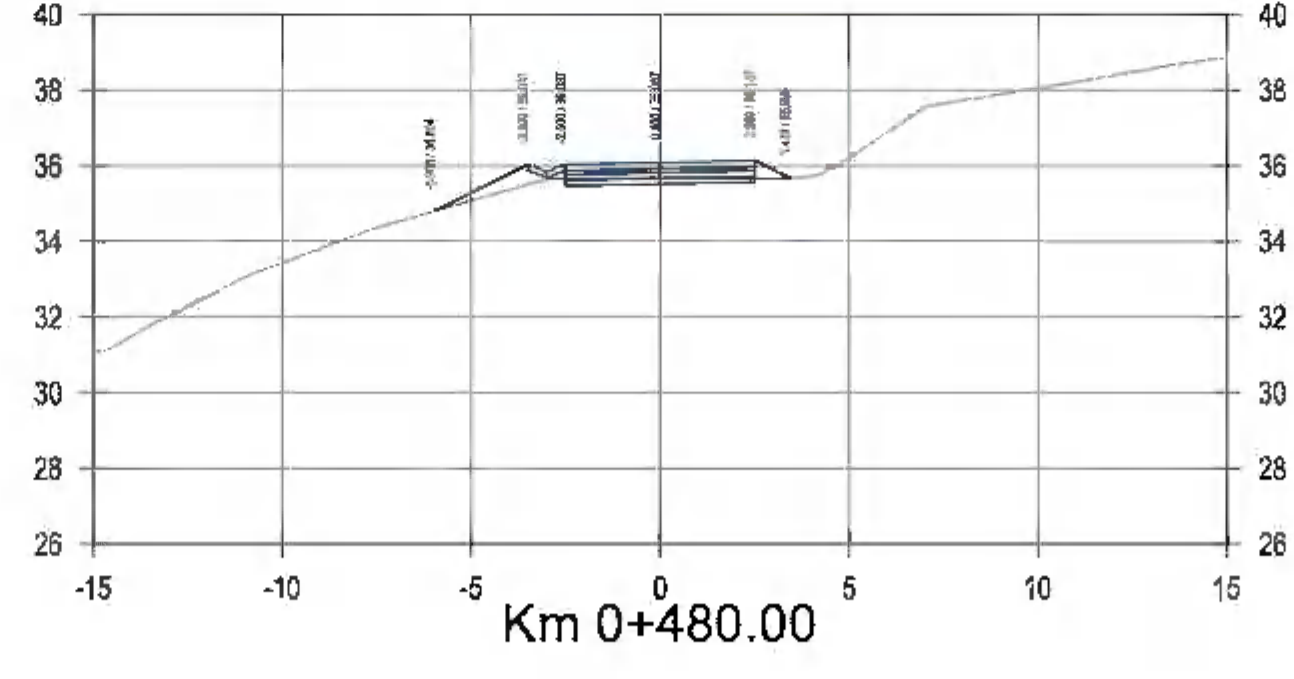
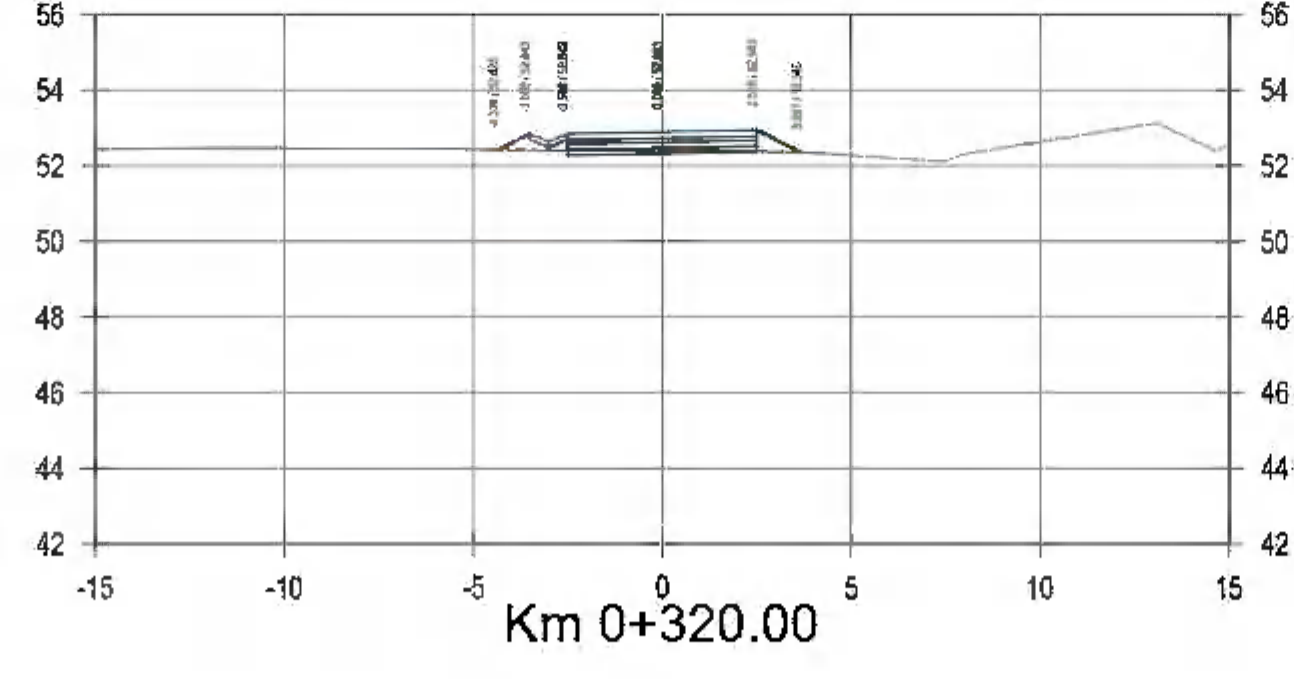
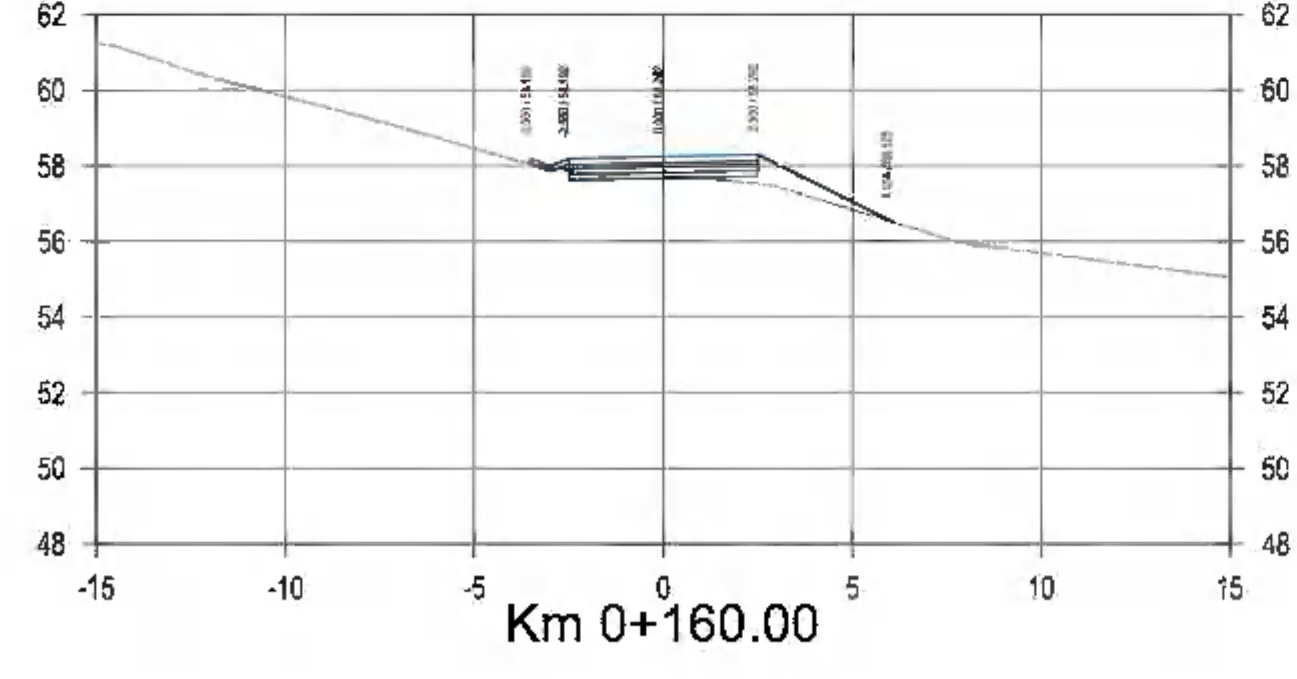
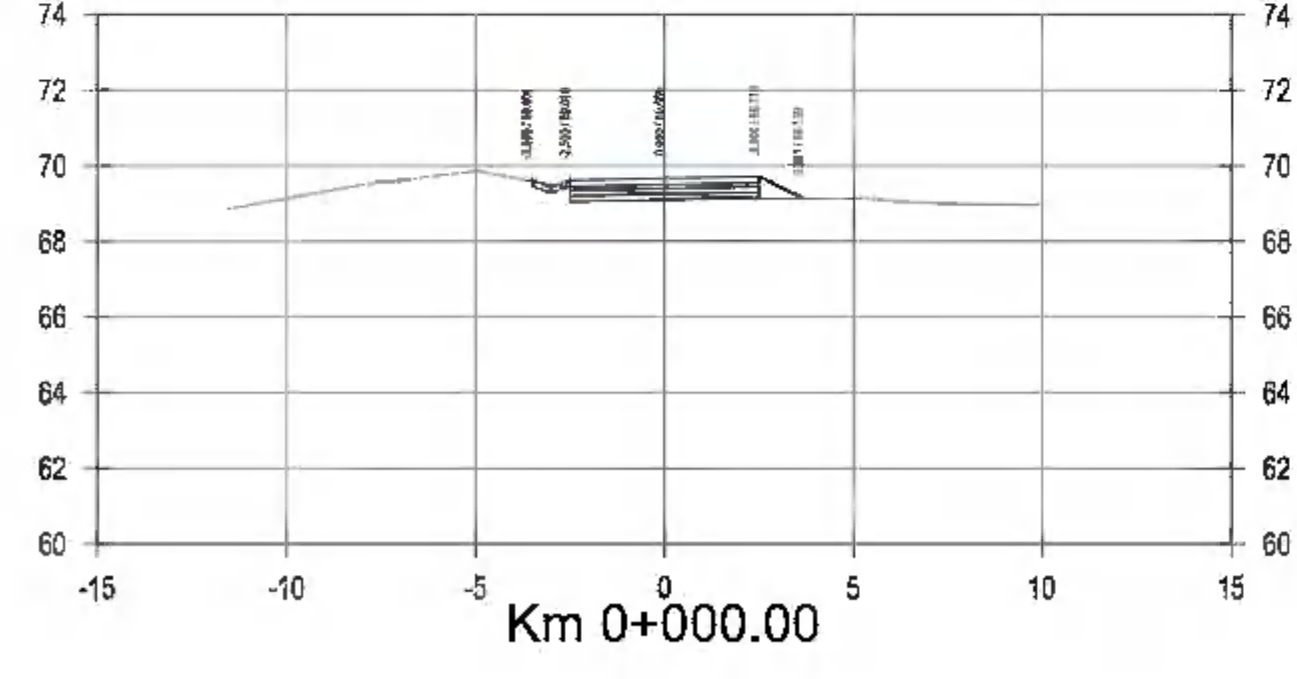
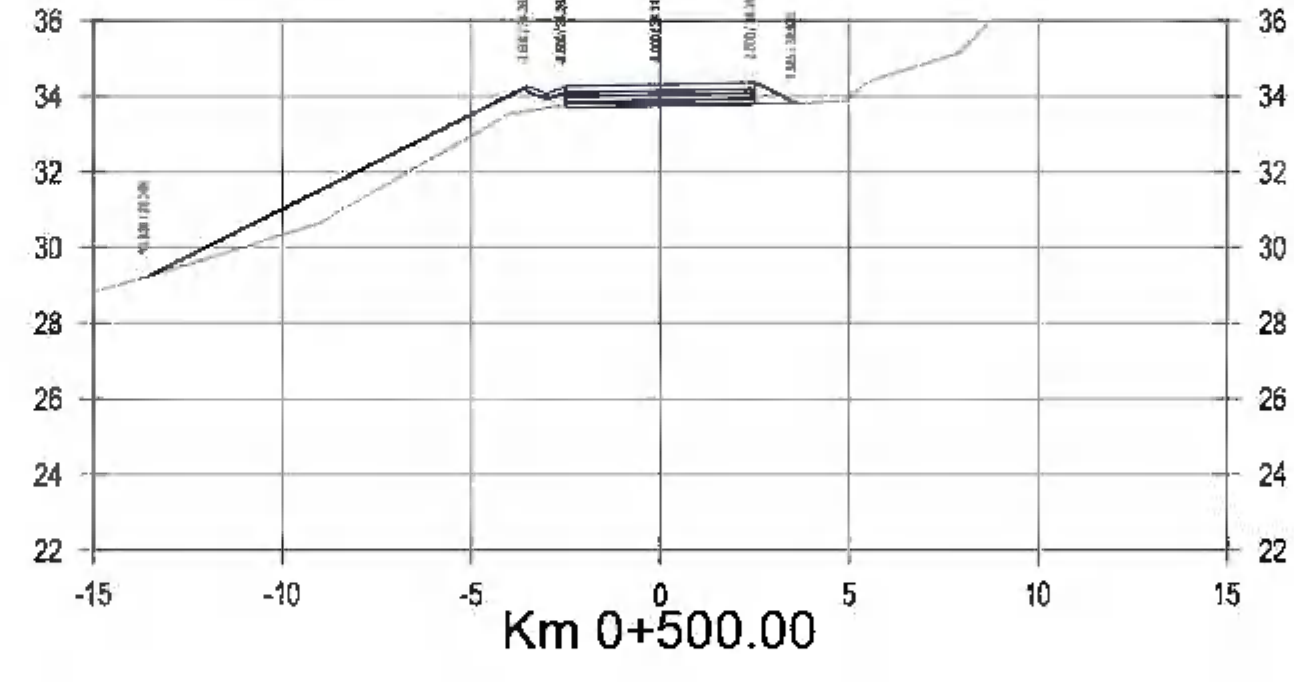
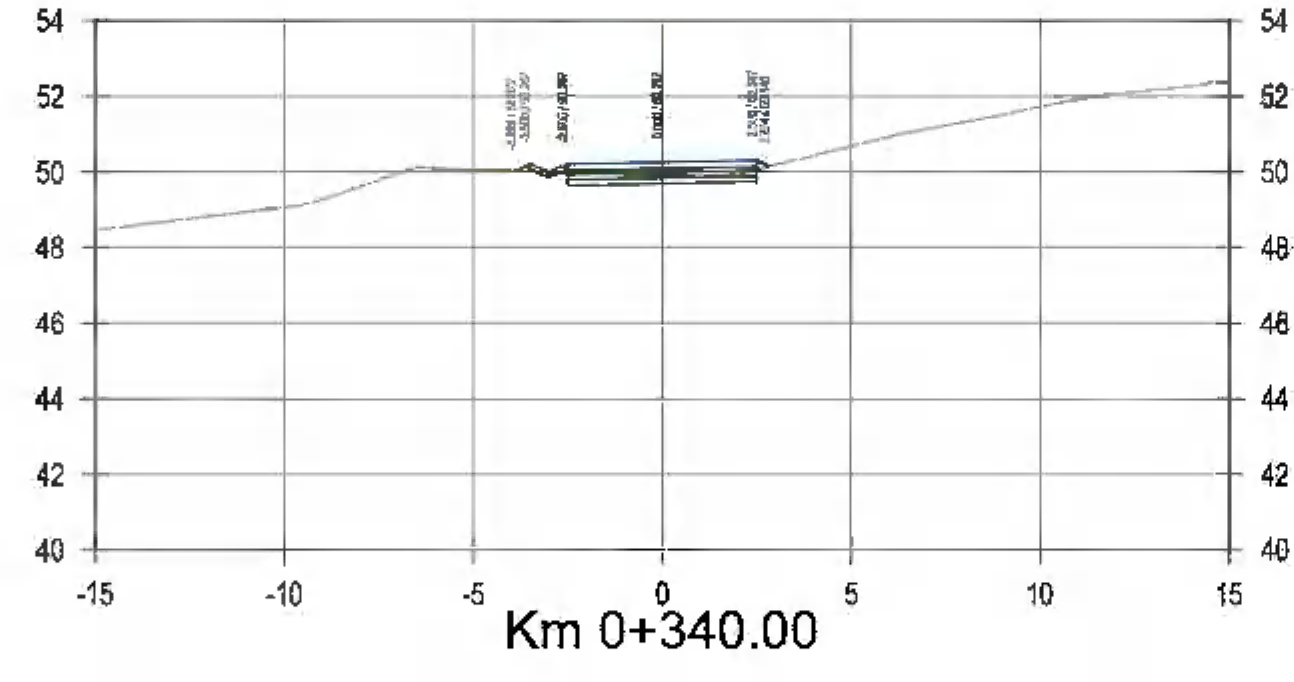
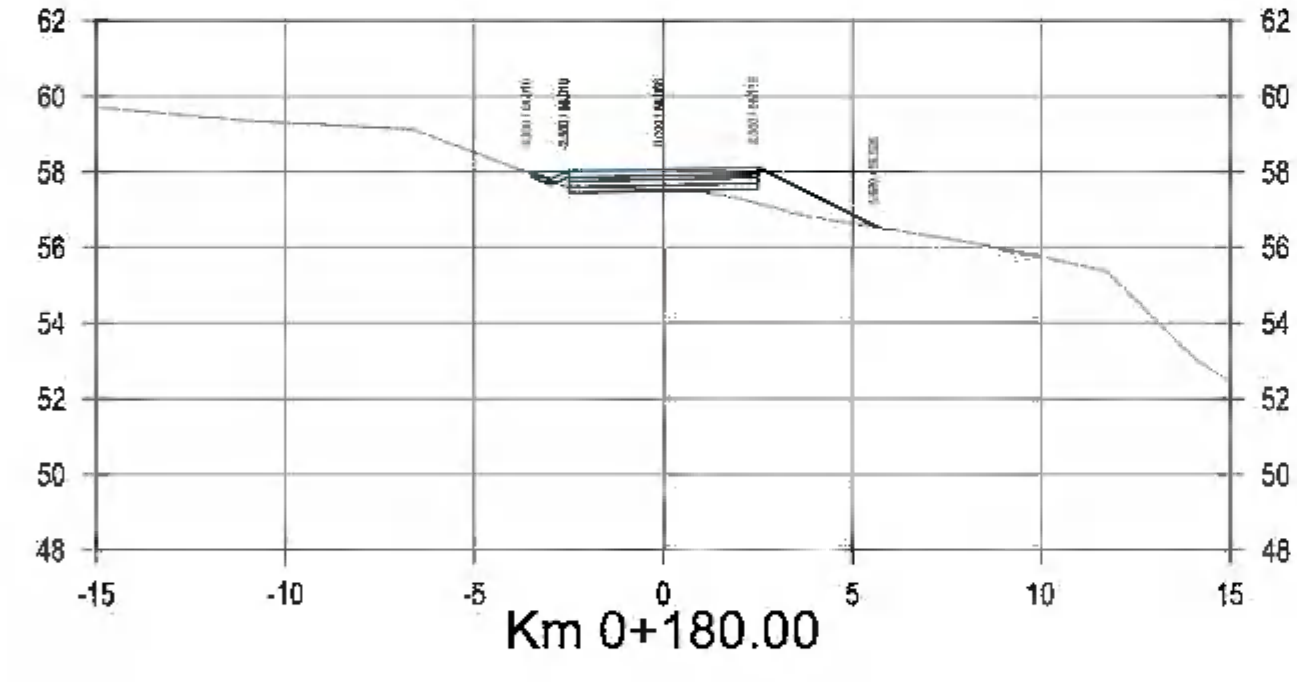
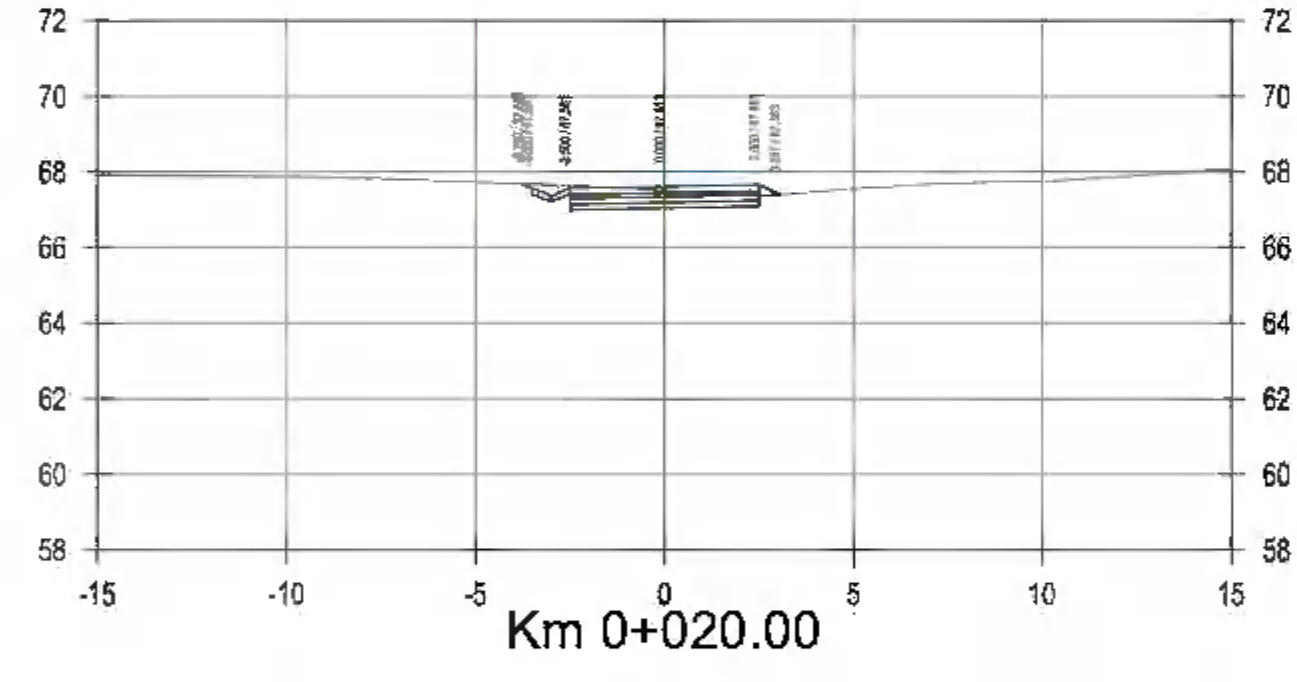
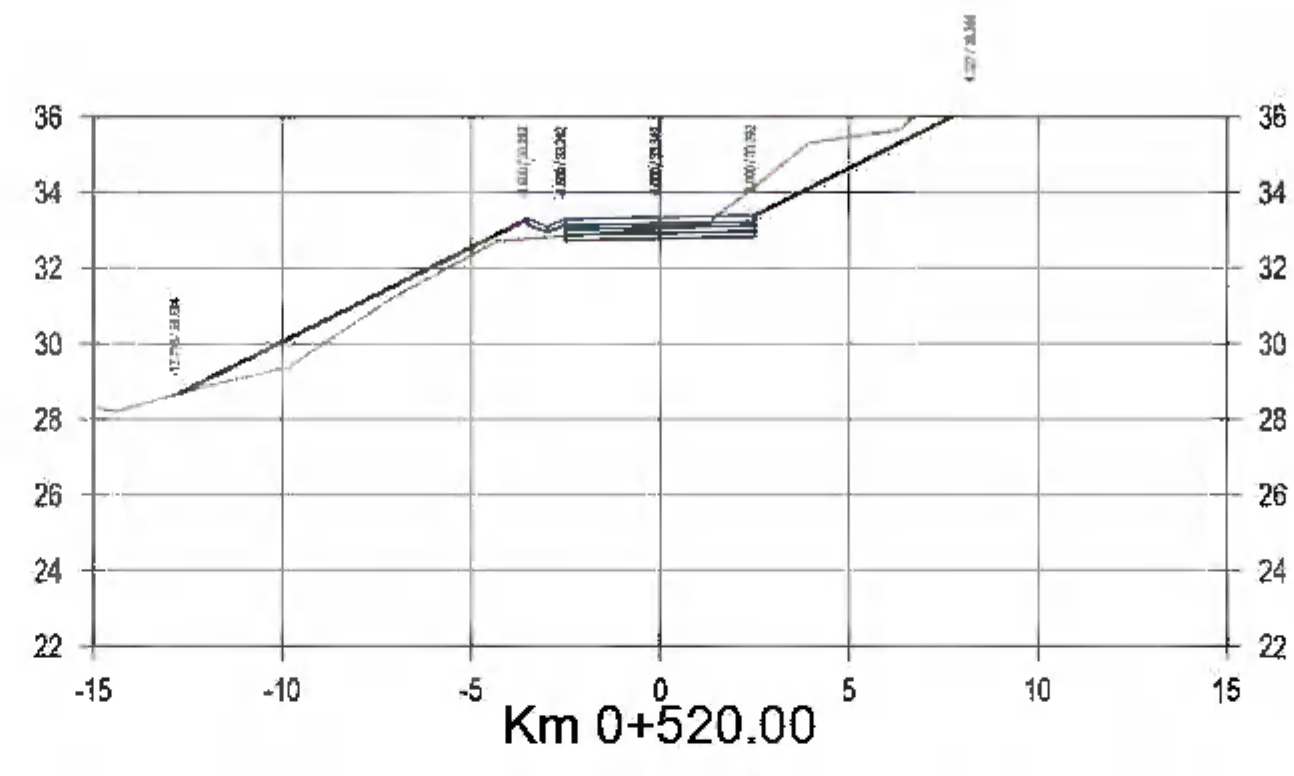
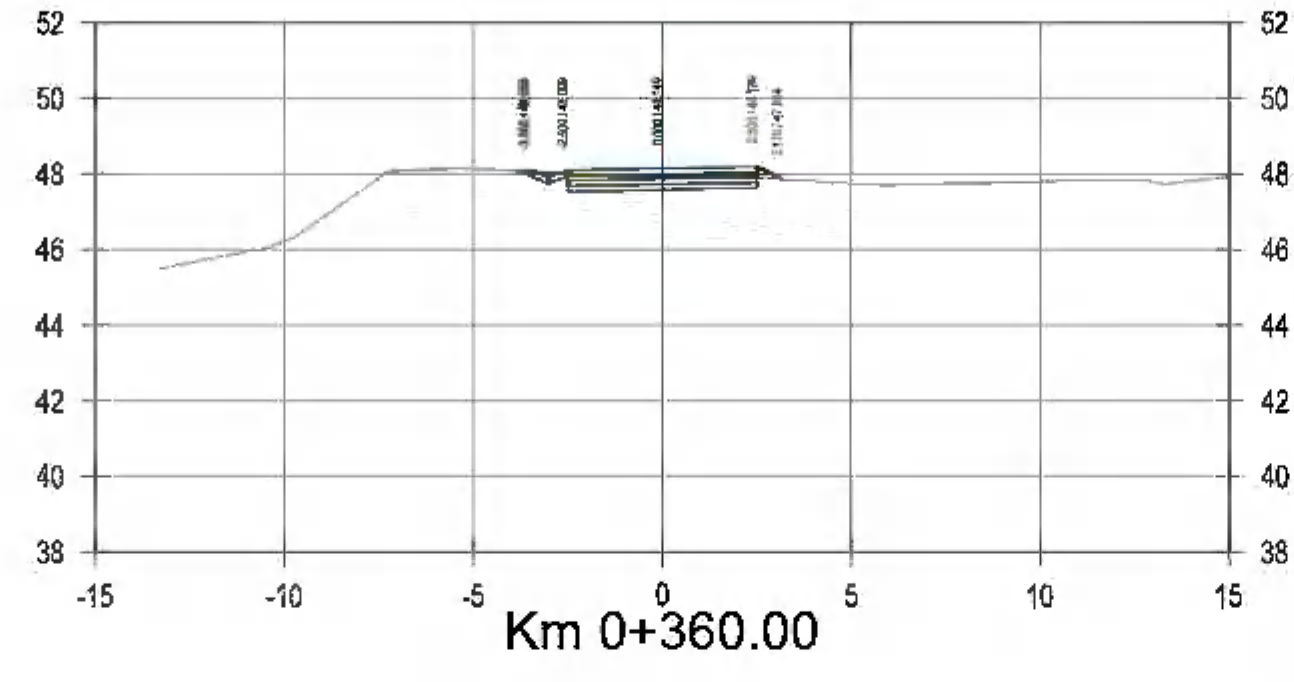
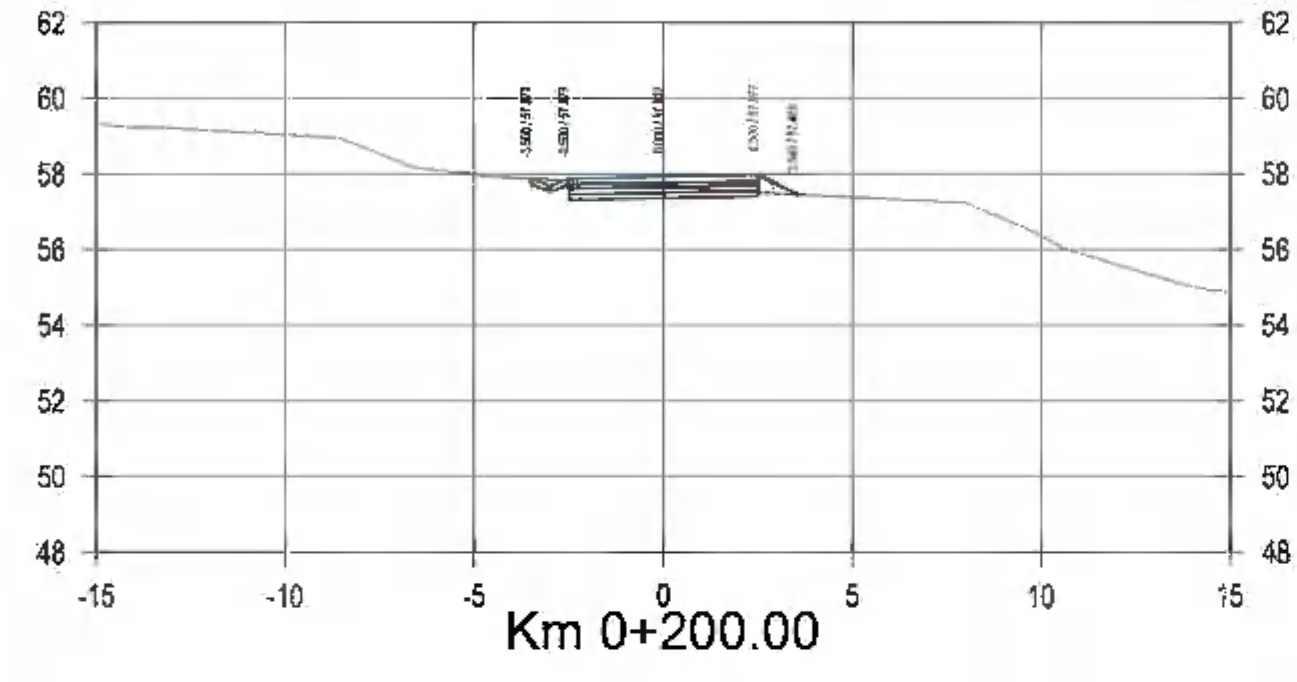
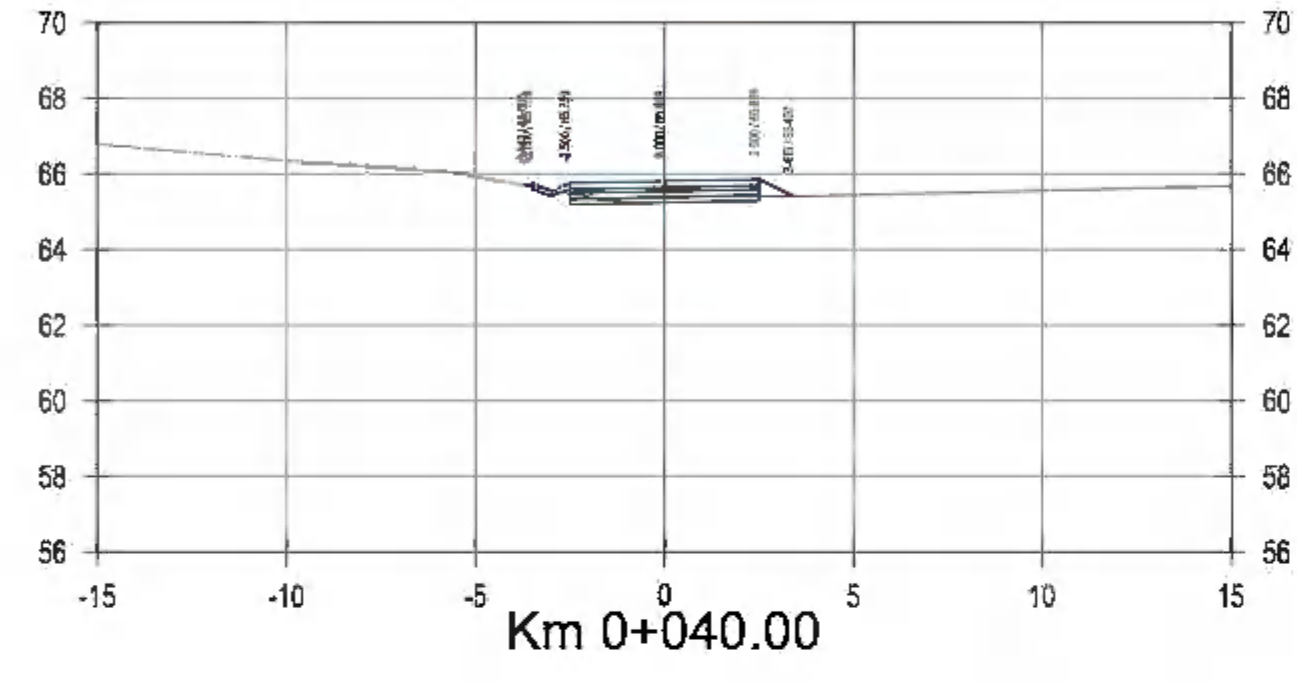
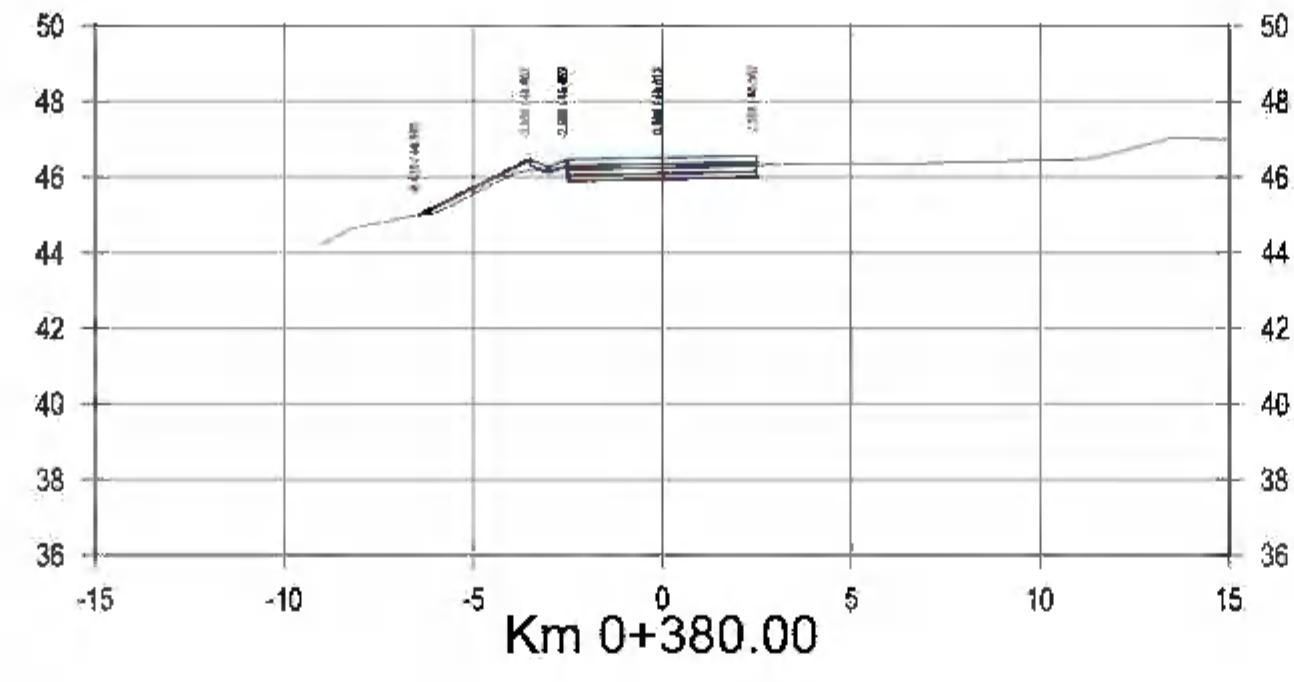
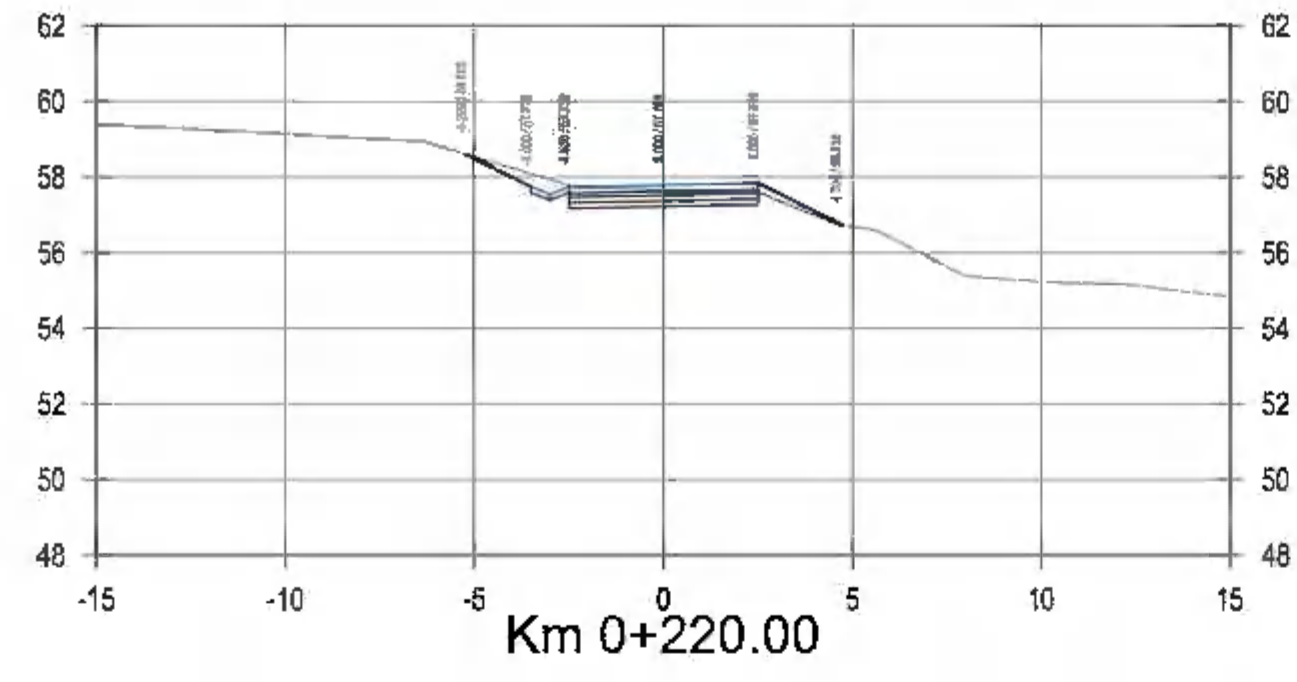
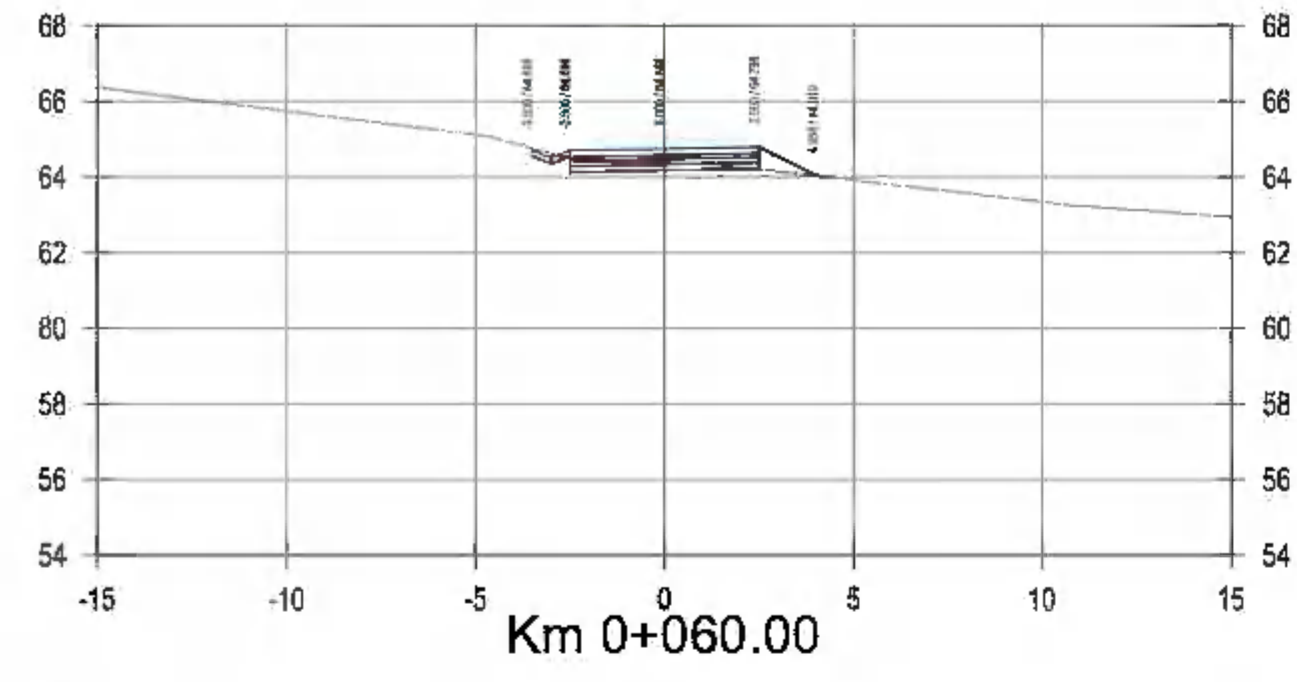
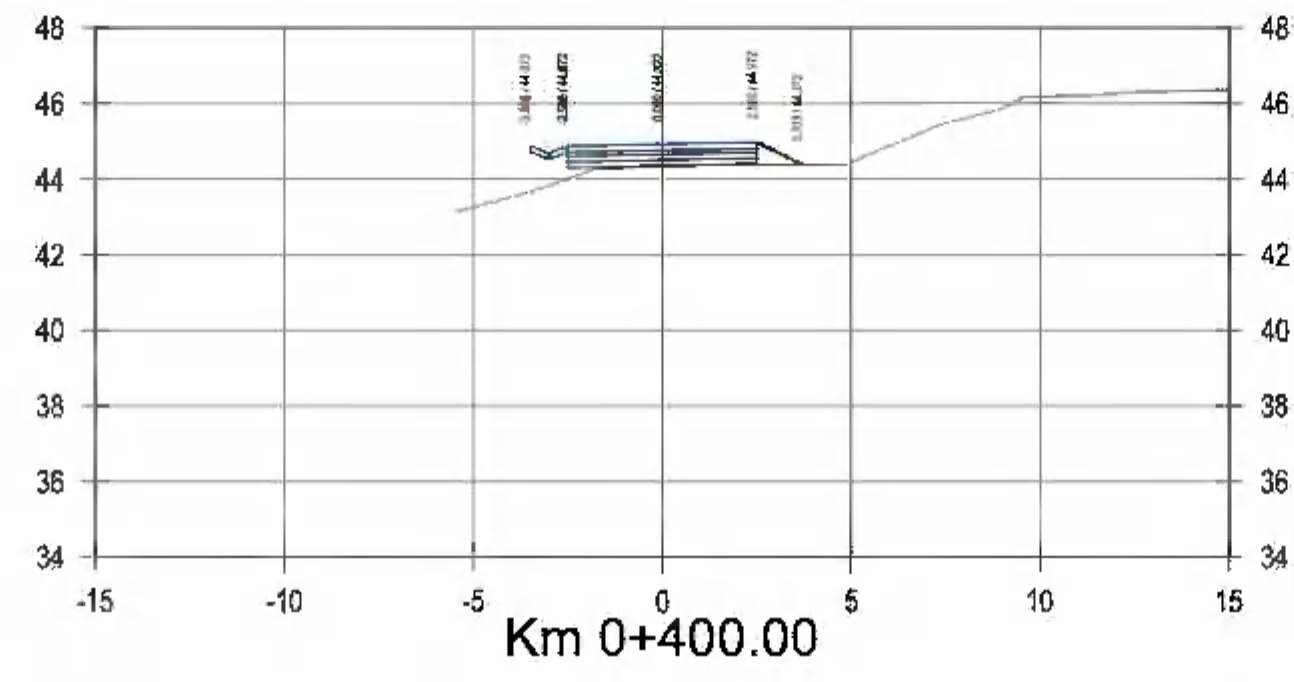
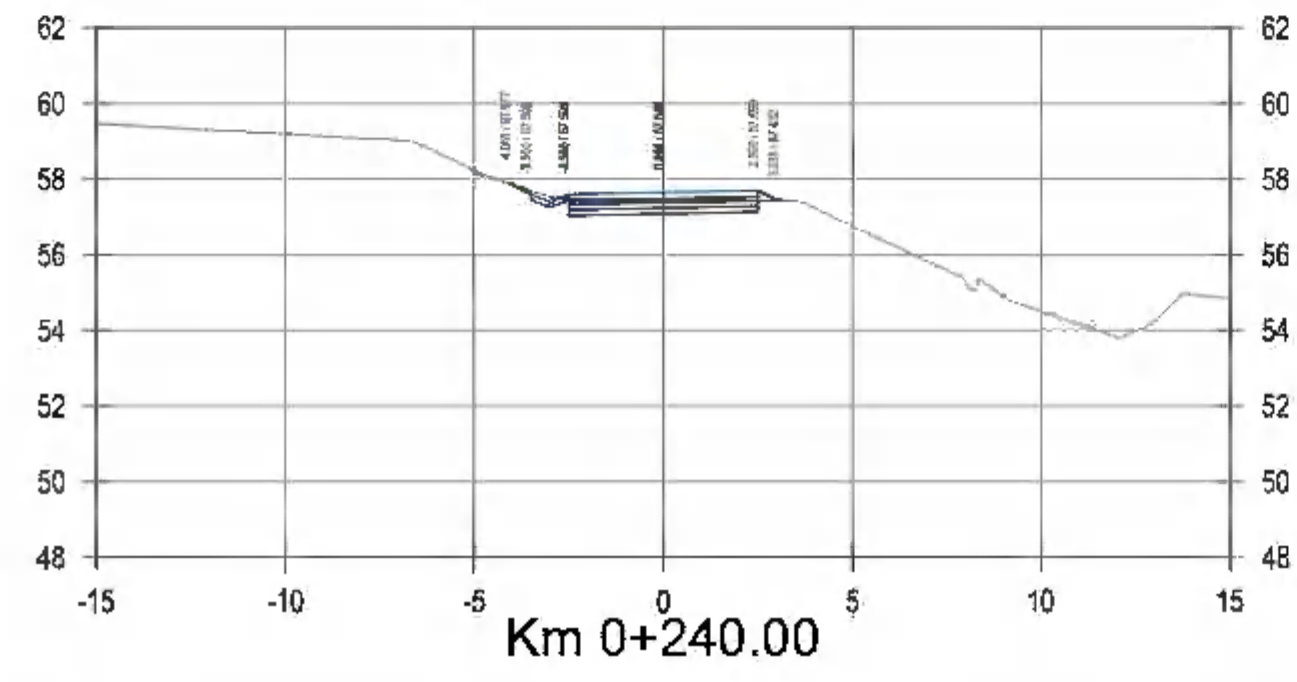
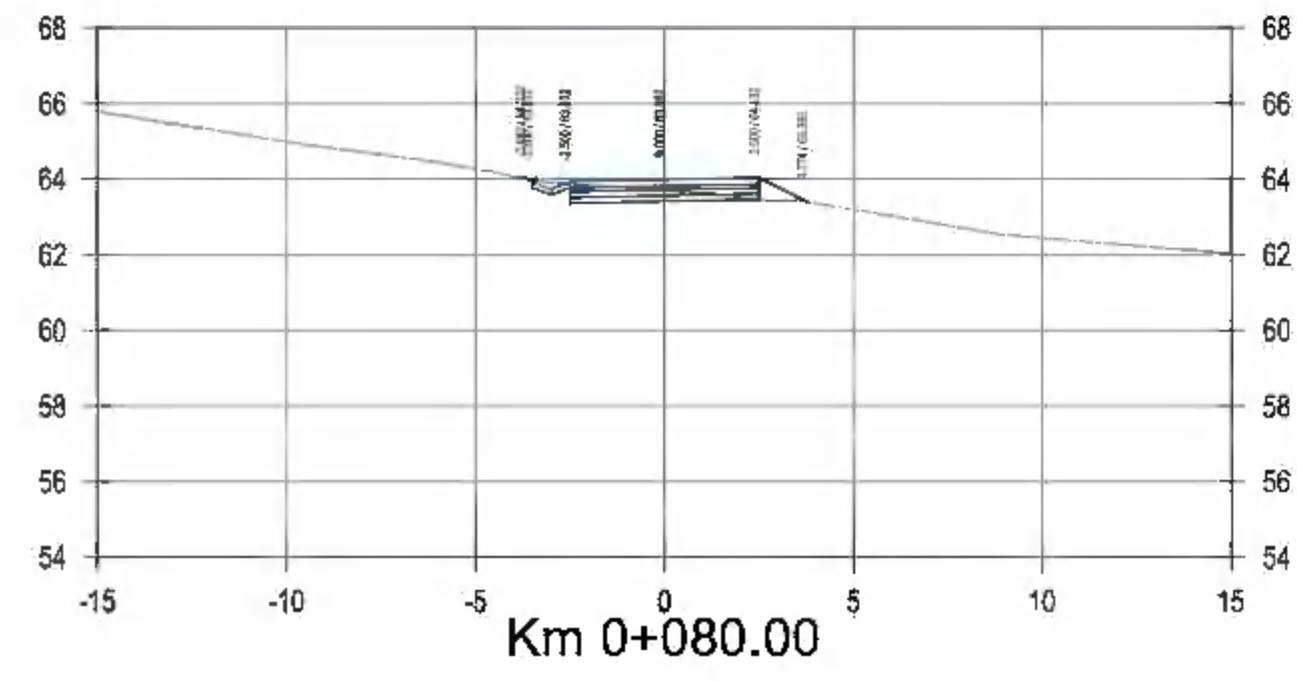
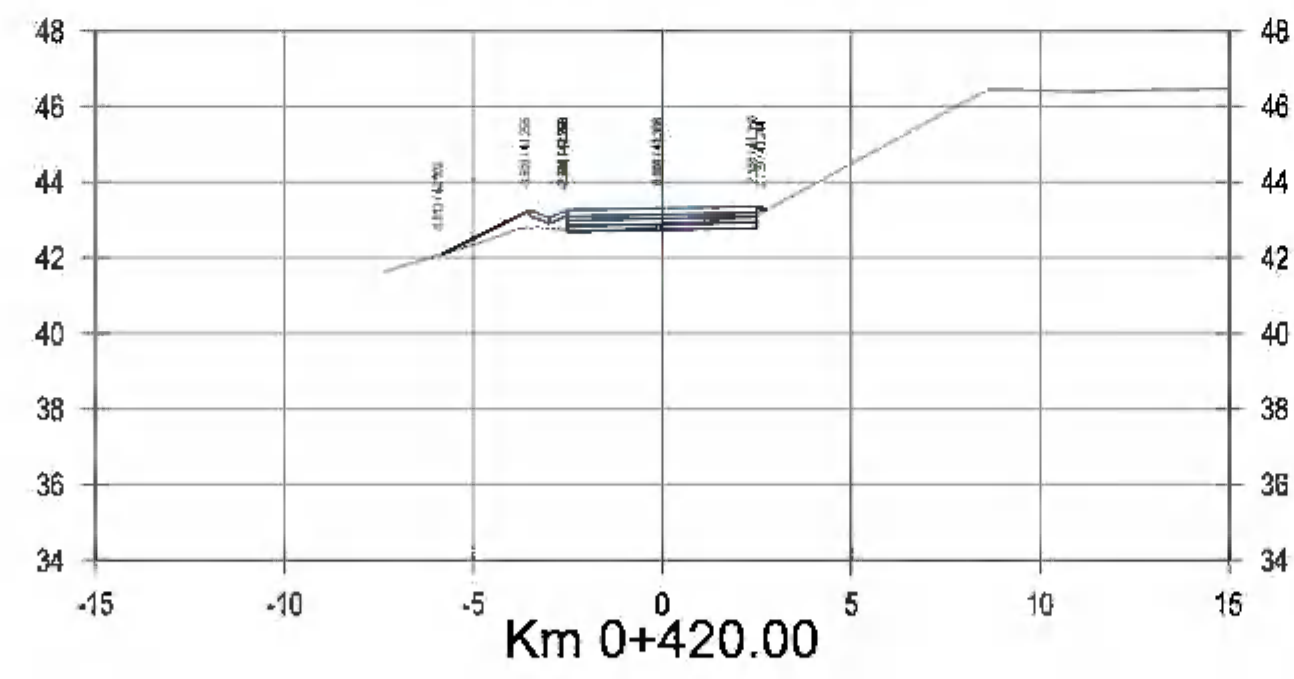
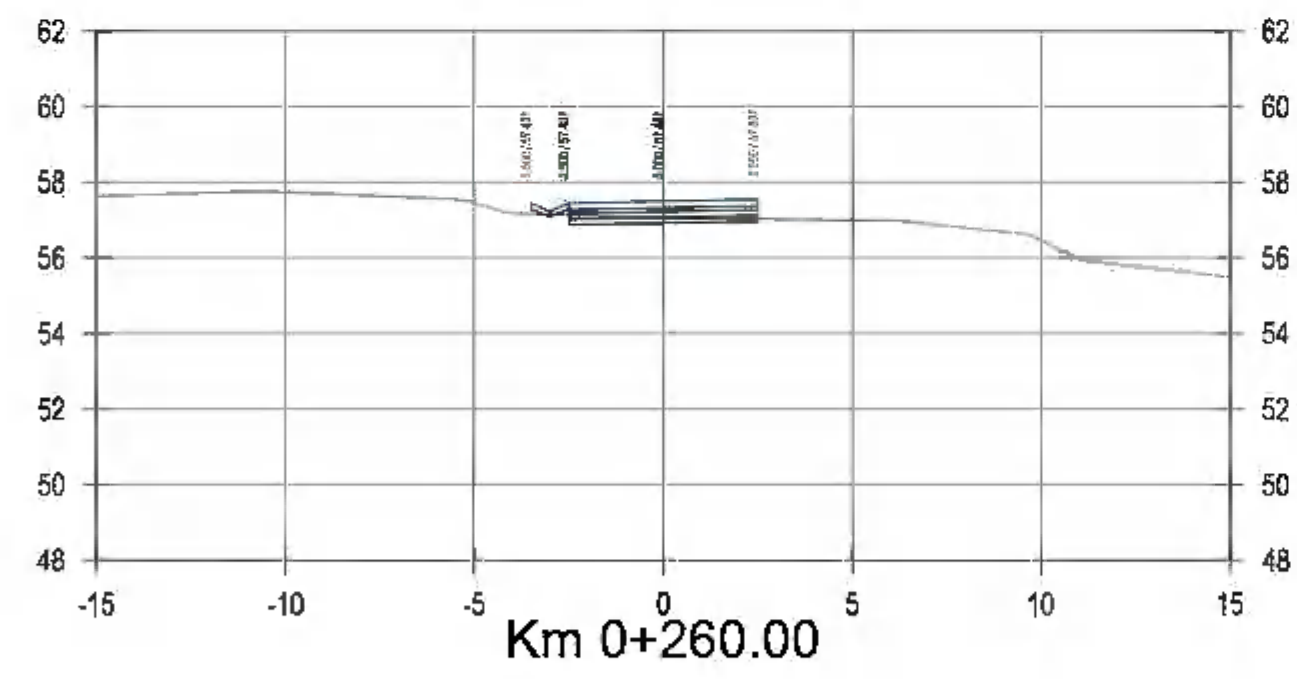
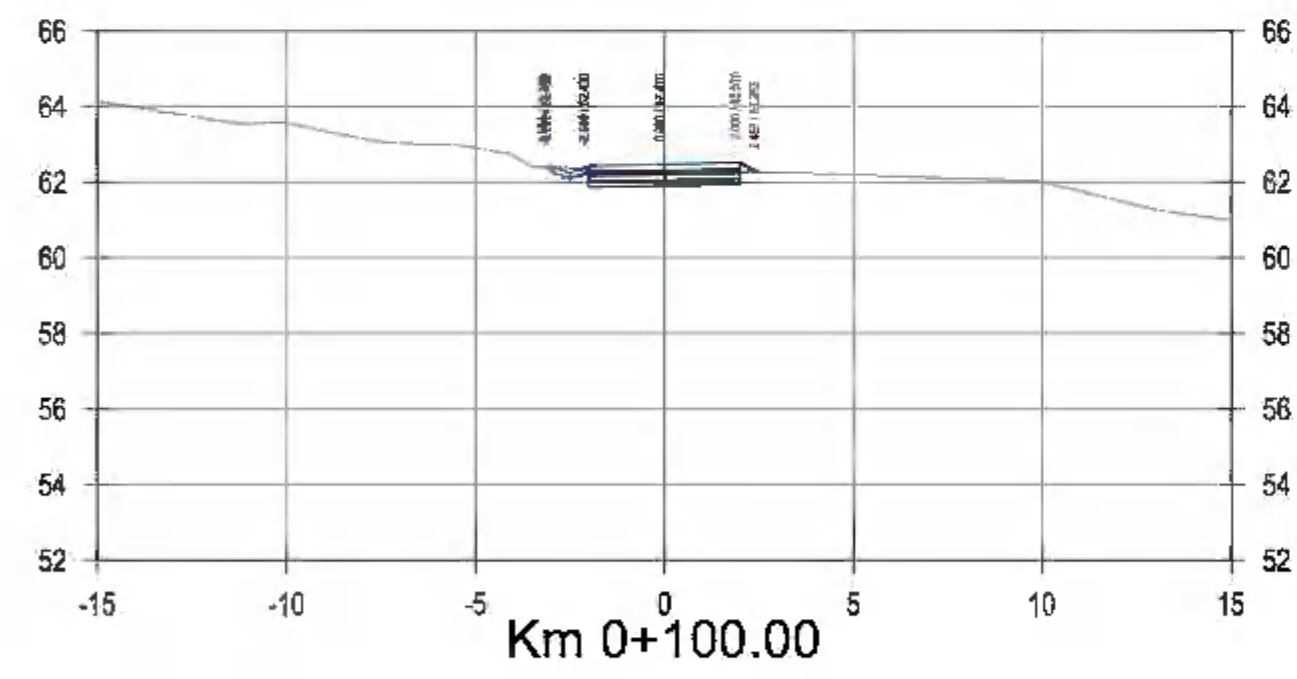
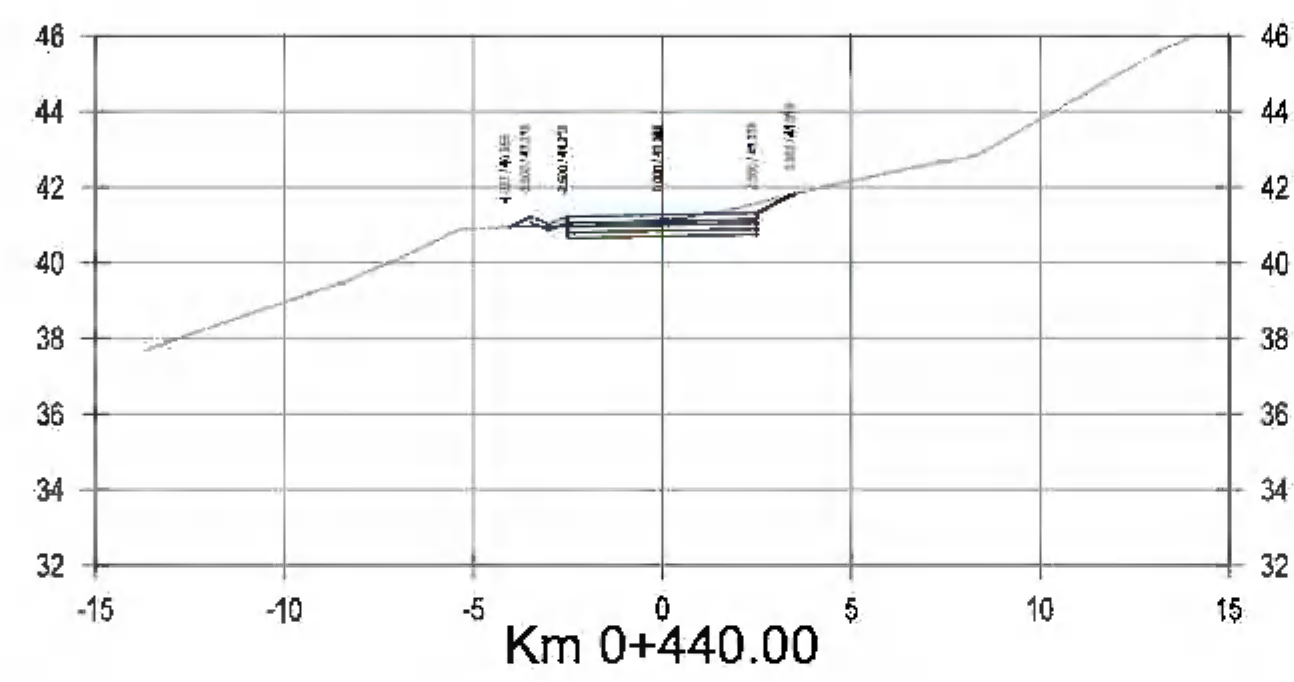
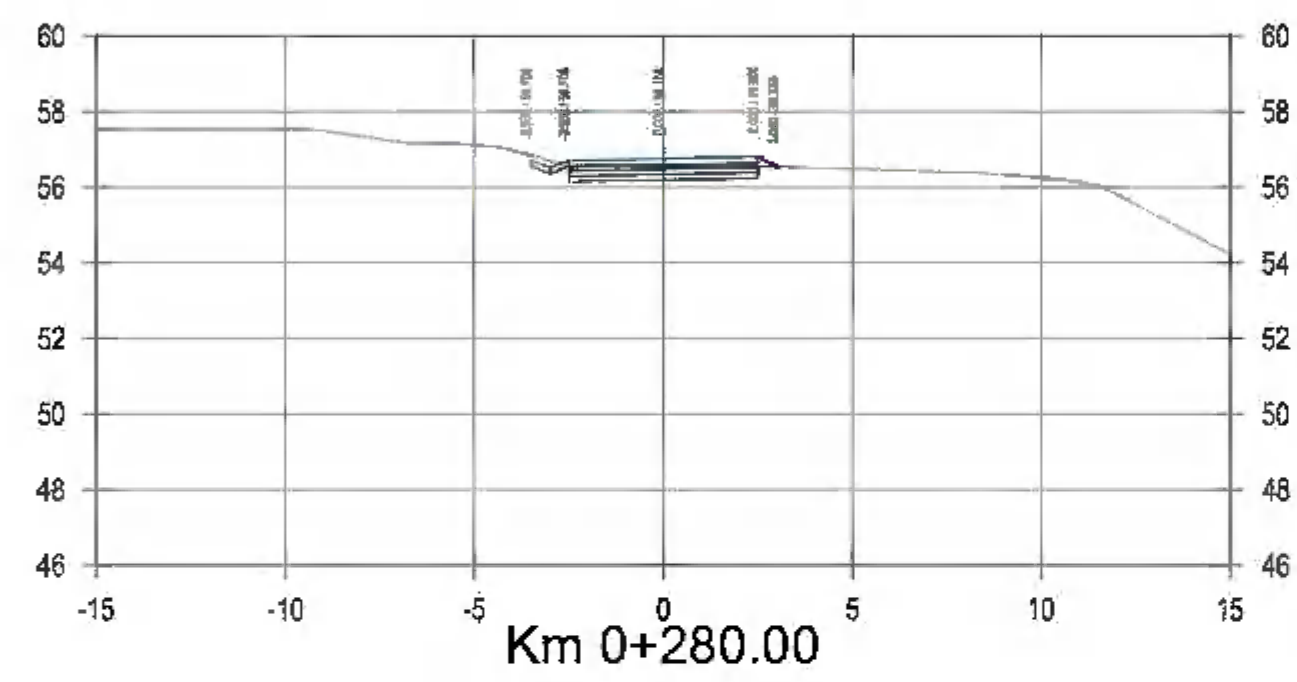
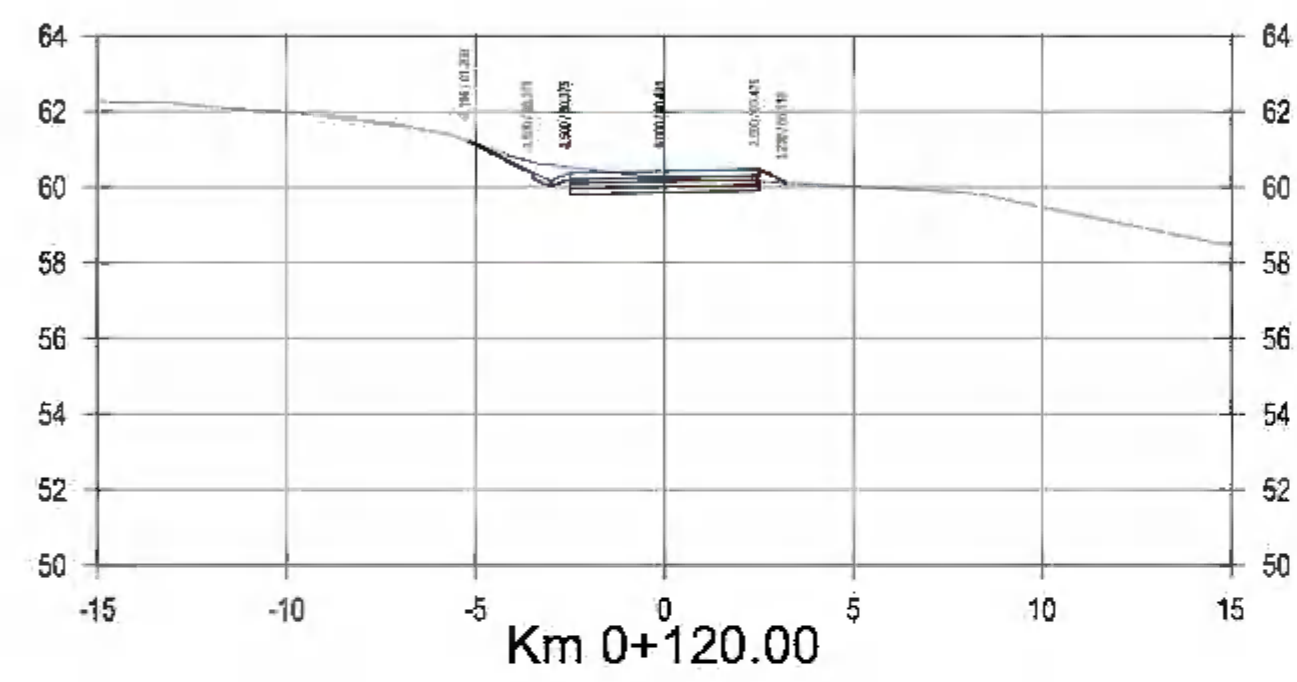
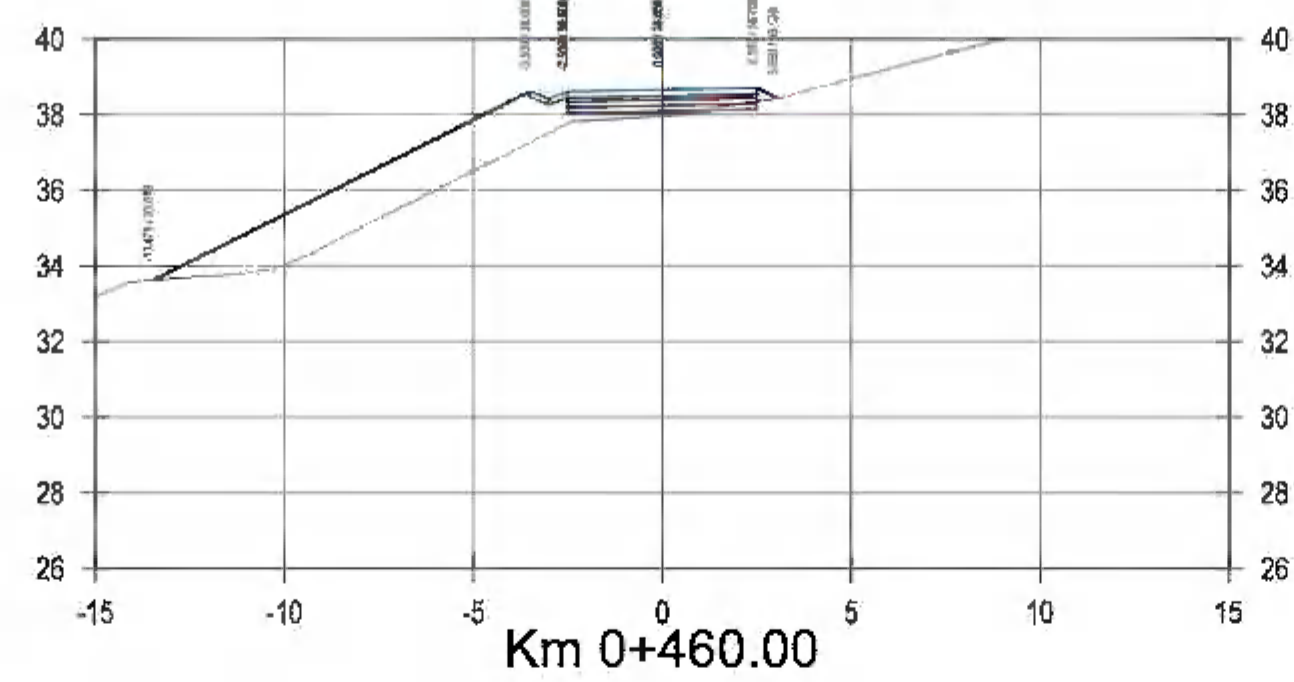
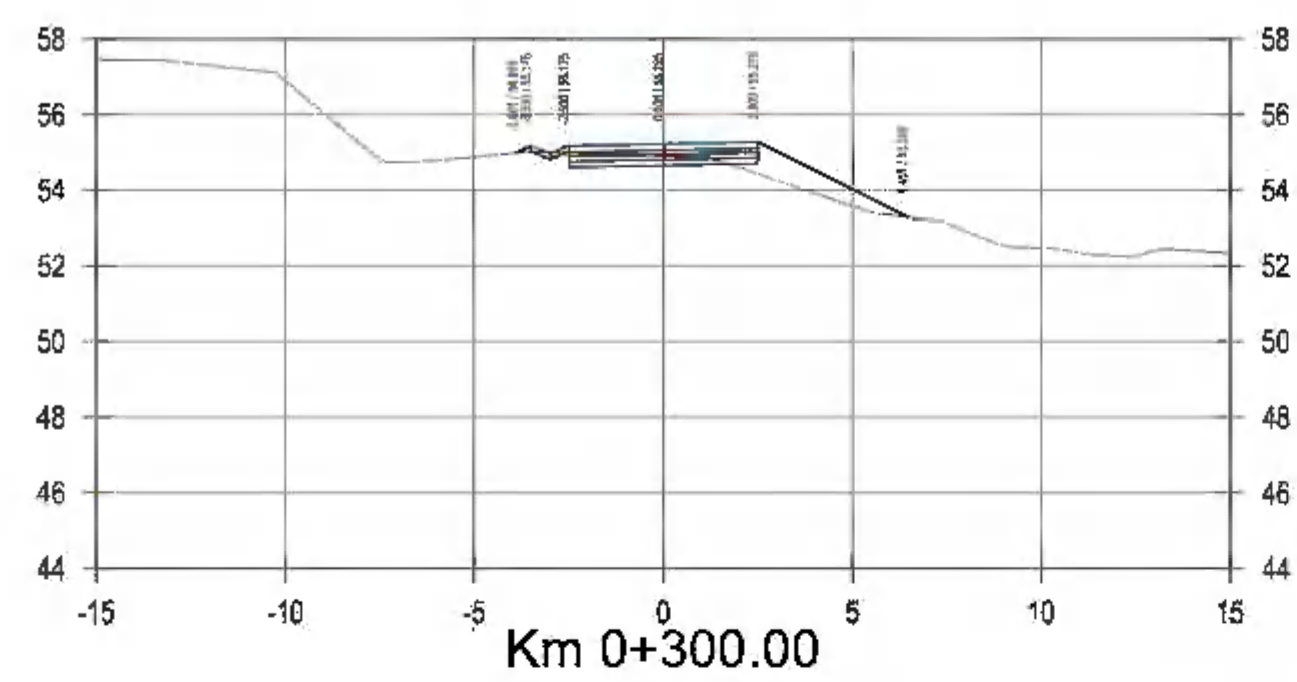
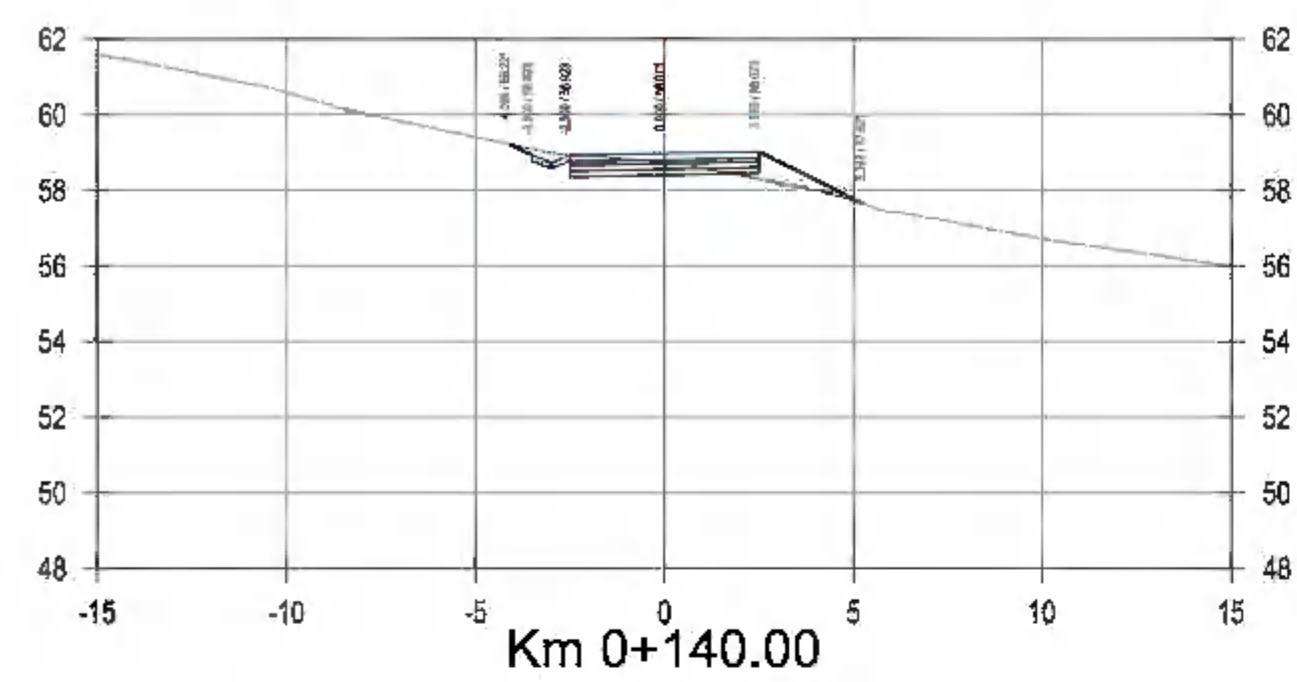
APPROVED BY _____

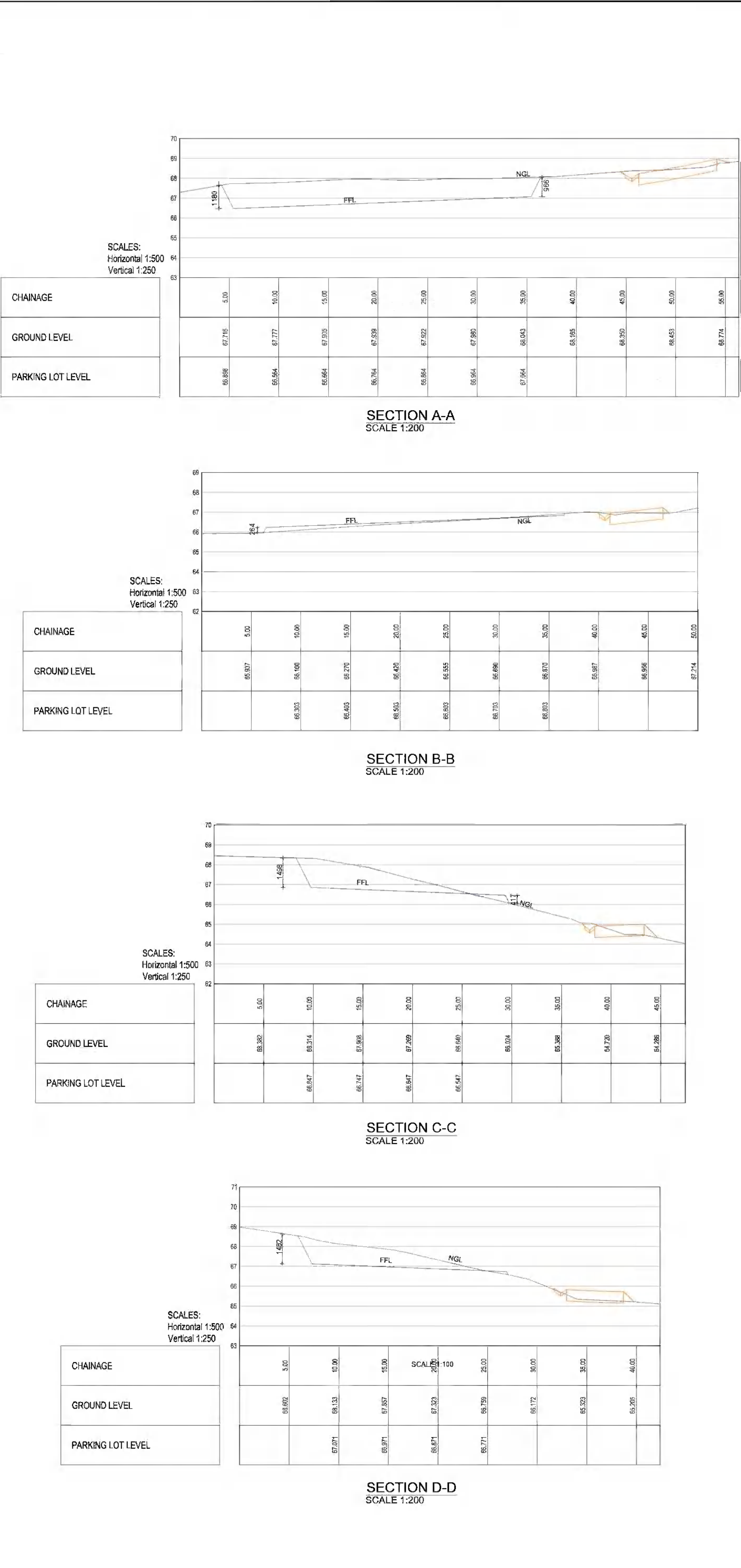
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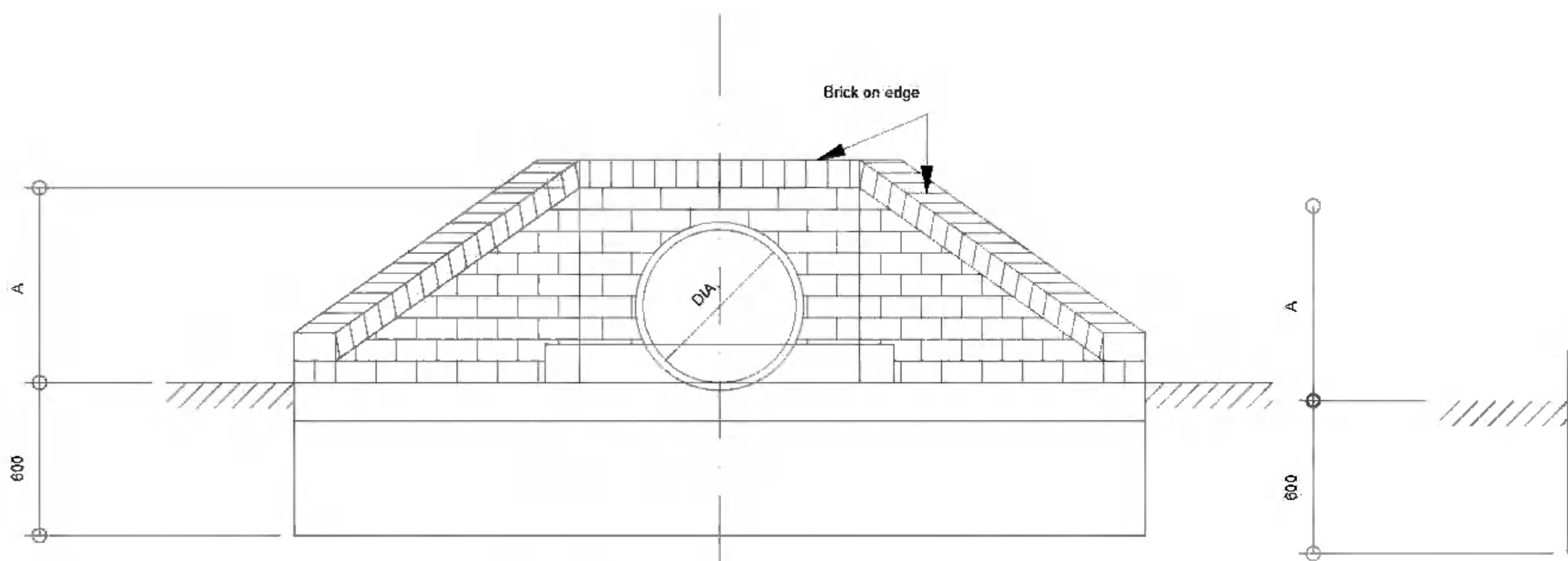
TENDER DRAWING



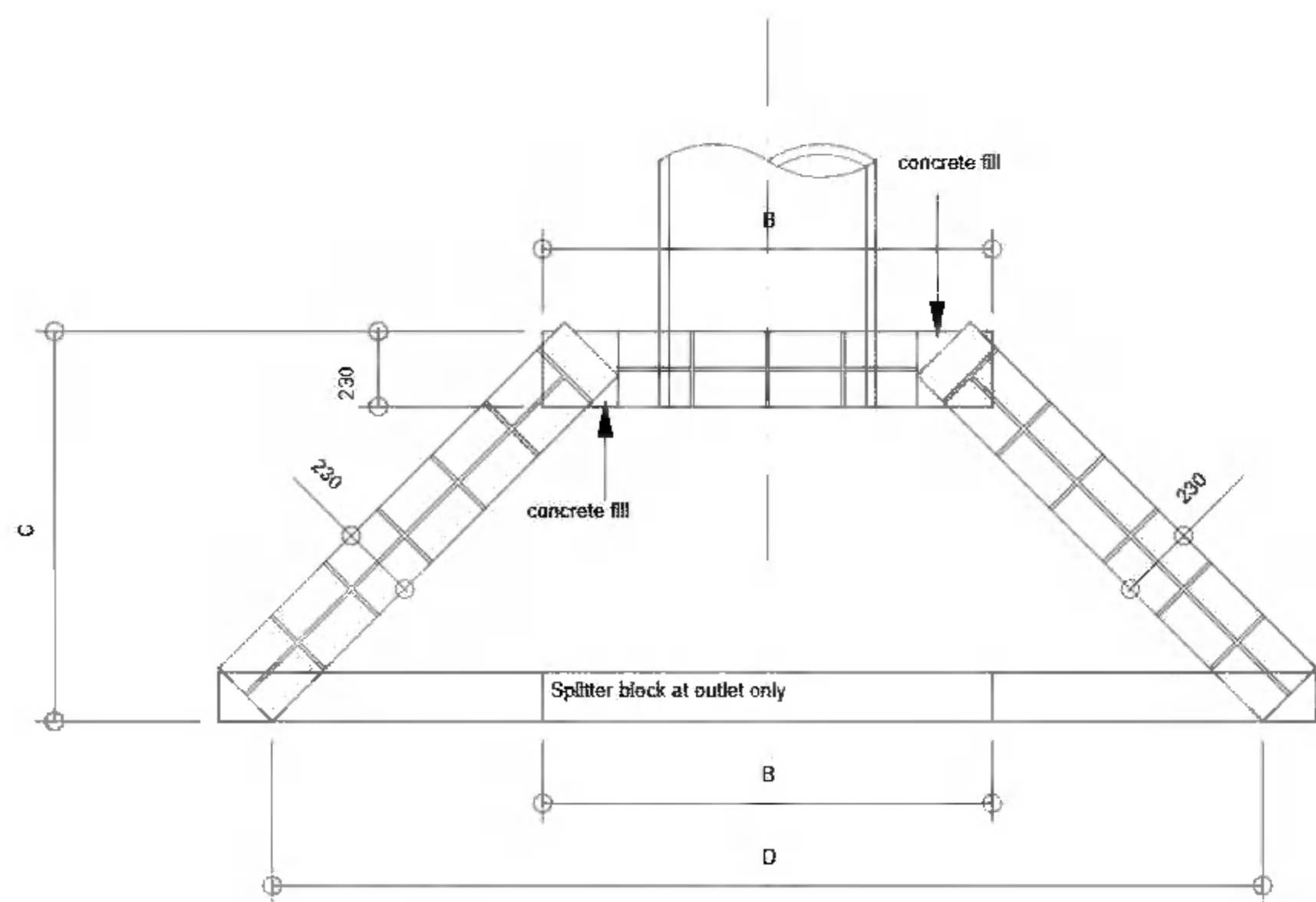


- | | |
|--|---|
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DISTRICT
MUNICIPALITY</p> </div> </div> | |
| <p>Project</p> <p style="text-align: center;">Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)</p> | |
| <p>Drawing description</p> <p style="text-align: center;">WWTW OFFICE PARKING LOT LAYOUT</p> | |
| <p>Drawn:</p> <p>J RAMGHULAM</p> <p>Scale(s):</p> <p>AS SHOWN</p> <p>Consultant Drawing number</p> <p>V45-06-05-003-PLAY-T-00</p> <p>Client Drawing number</p> | <p>Date:</p> <p>AUGUST 2026</p> <p>Sheet No.:</p> <p>Sheet 1 of 1</p> <p>Drawing Size</p> <p>A0</p> |

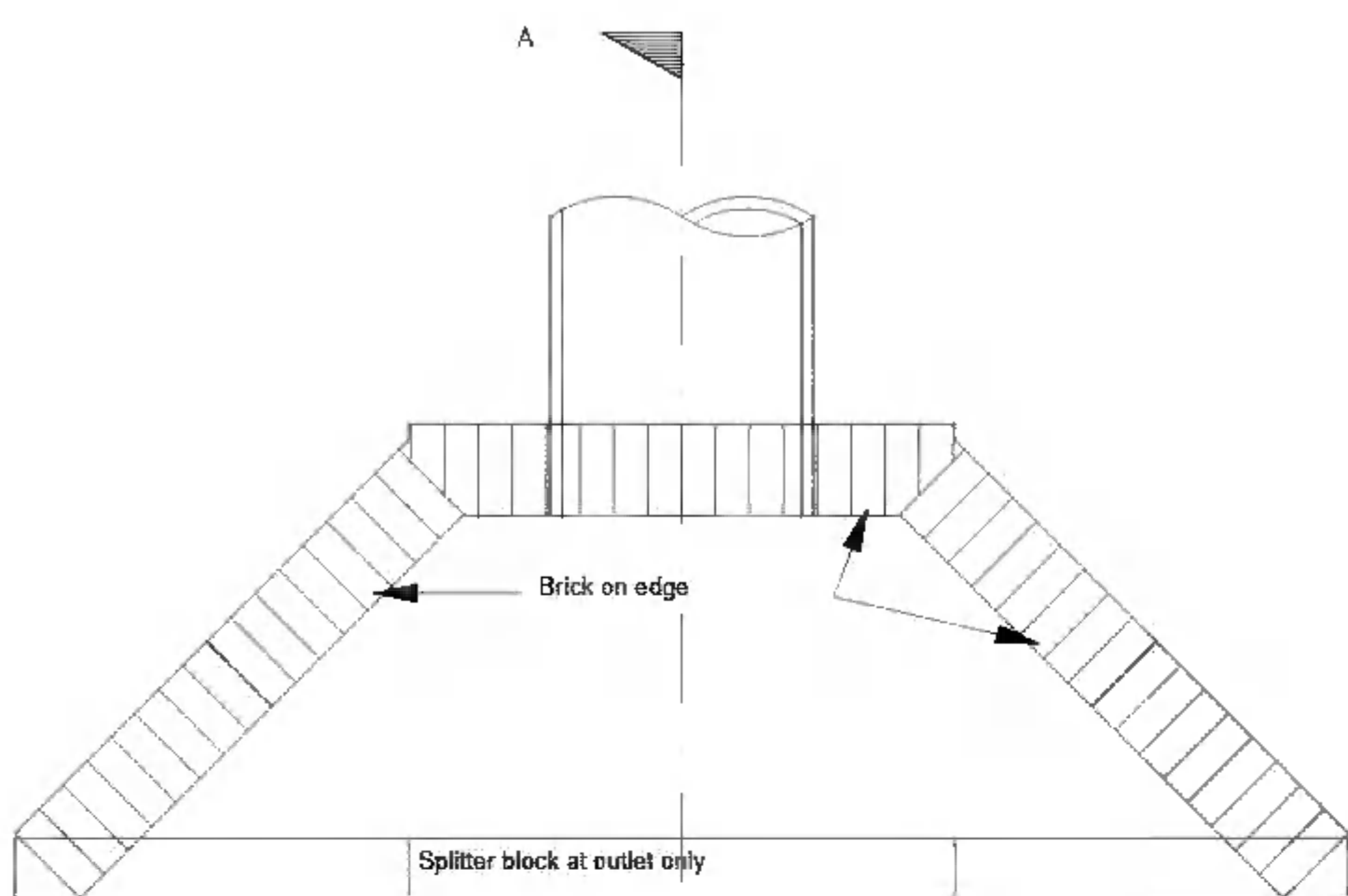
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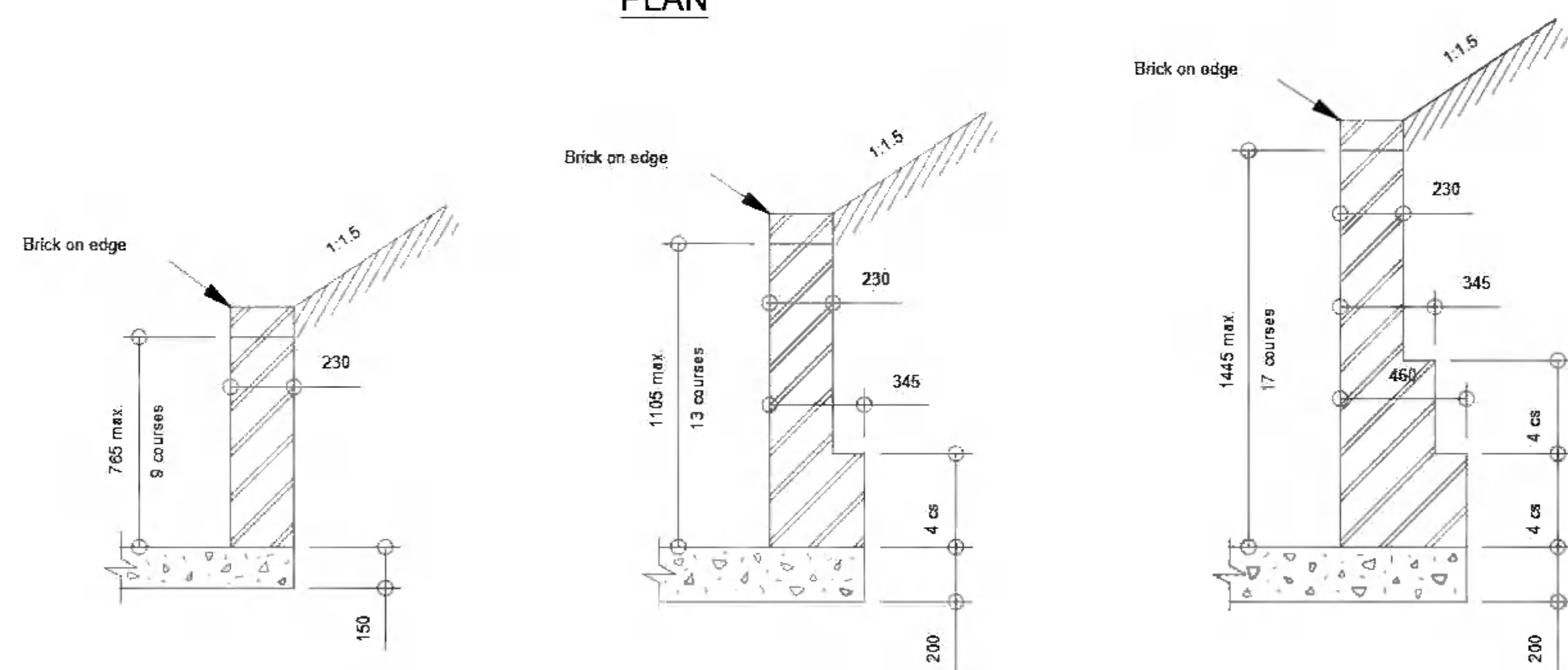
FRONT ELEVATION - SINGLE PIPE



LAYOUT OF BRICKWORK

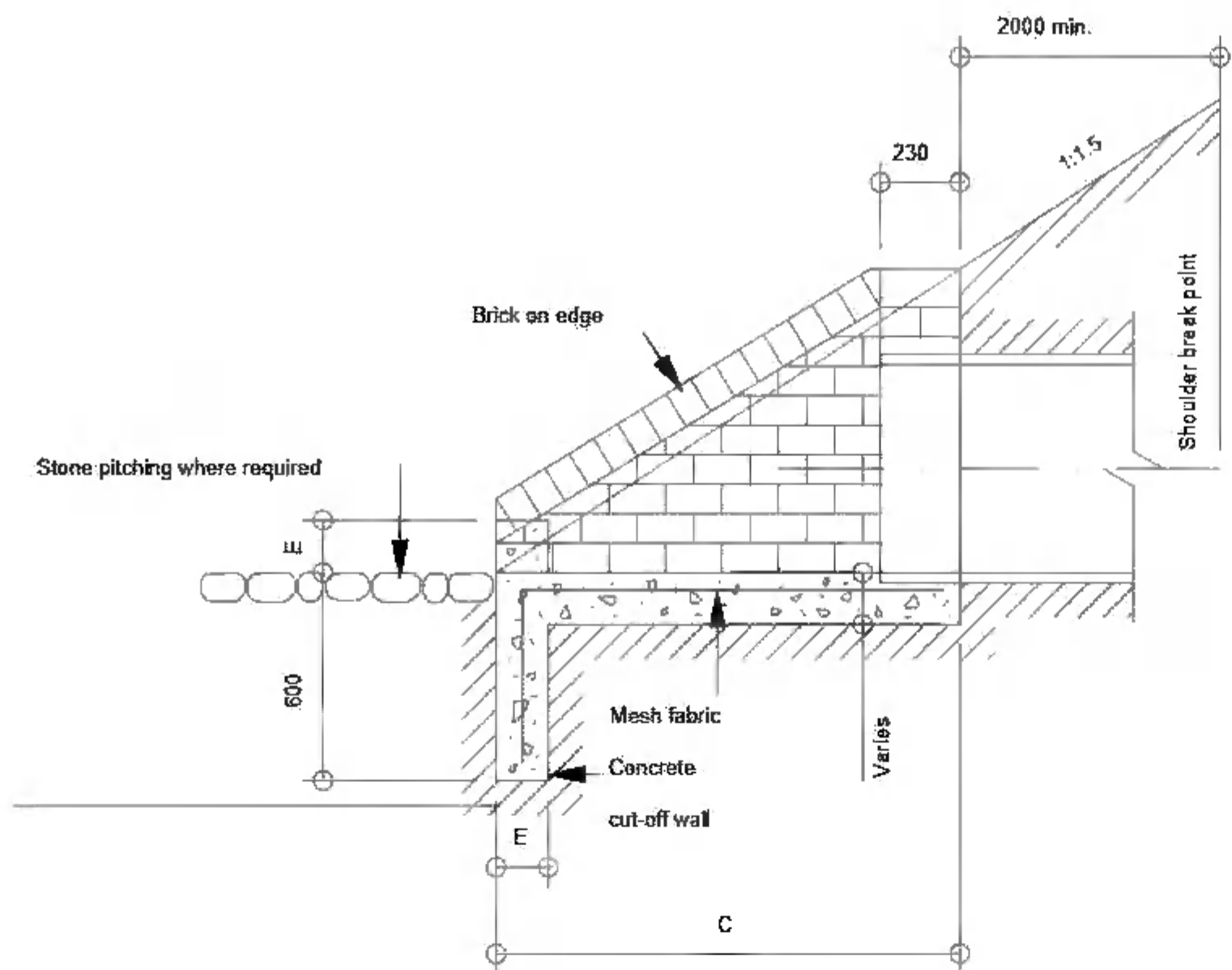


PLAN

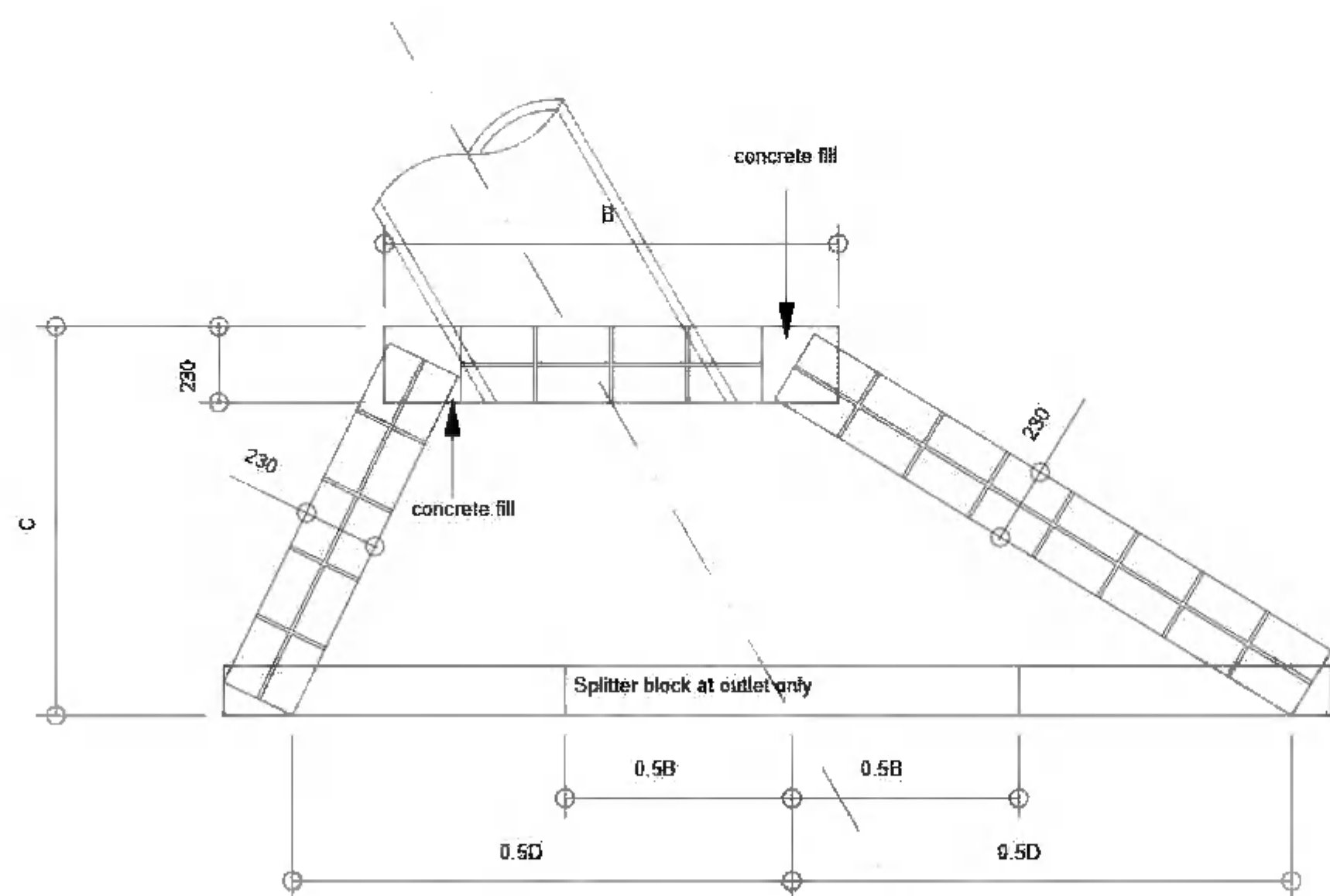


TYPICAL RETAINING WALL DETAILS

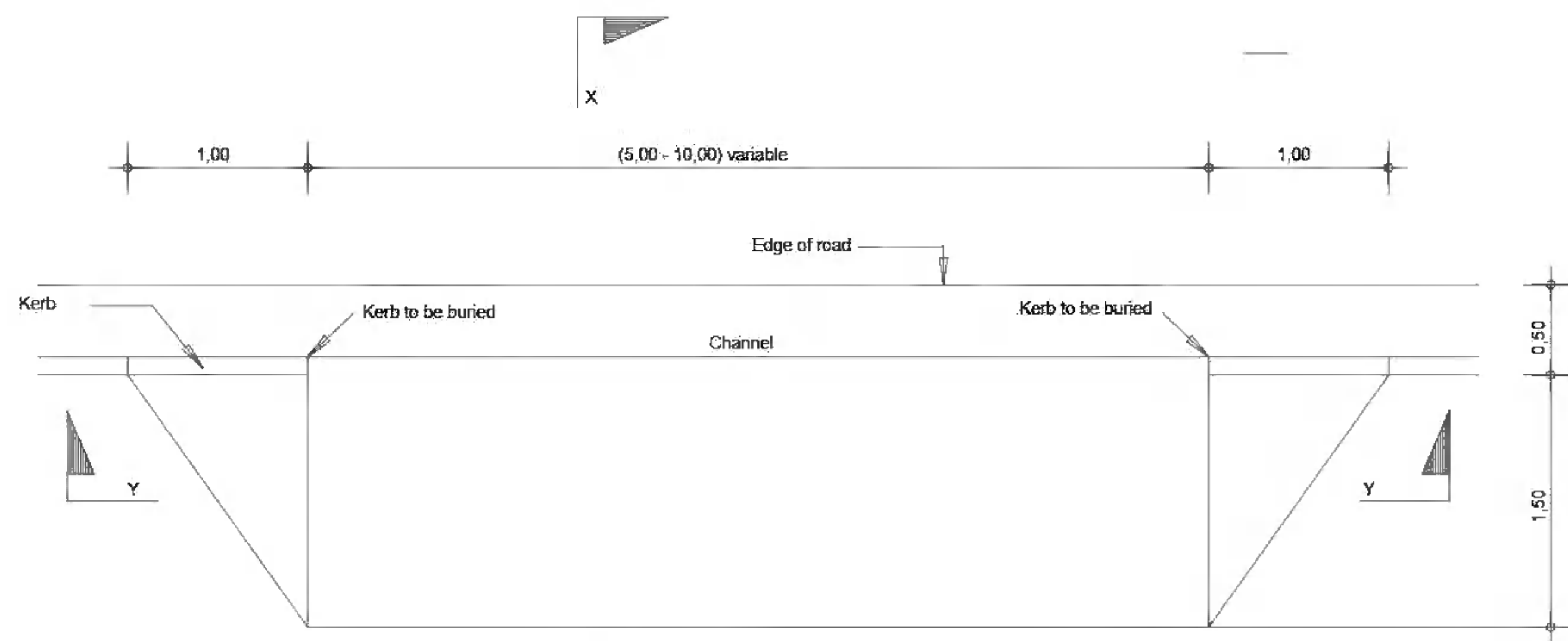
Dimensions (mm)					
Nominal Dia.	A	B	C	D	E
450	595	1 150	1 050	2 700	150
600	765	1 380	1 200	3 000	150
750	935	1 610	1 350	3 300	150
900	1 105	1 840	1 600	3 600	230
1 050	1 275	2 070	1 750	3 900	230
1 200	1 445	2 300	1 900	4 200	230



SECTION A-A



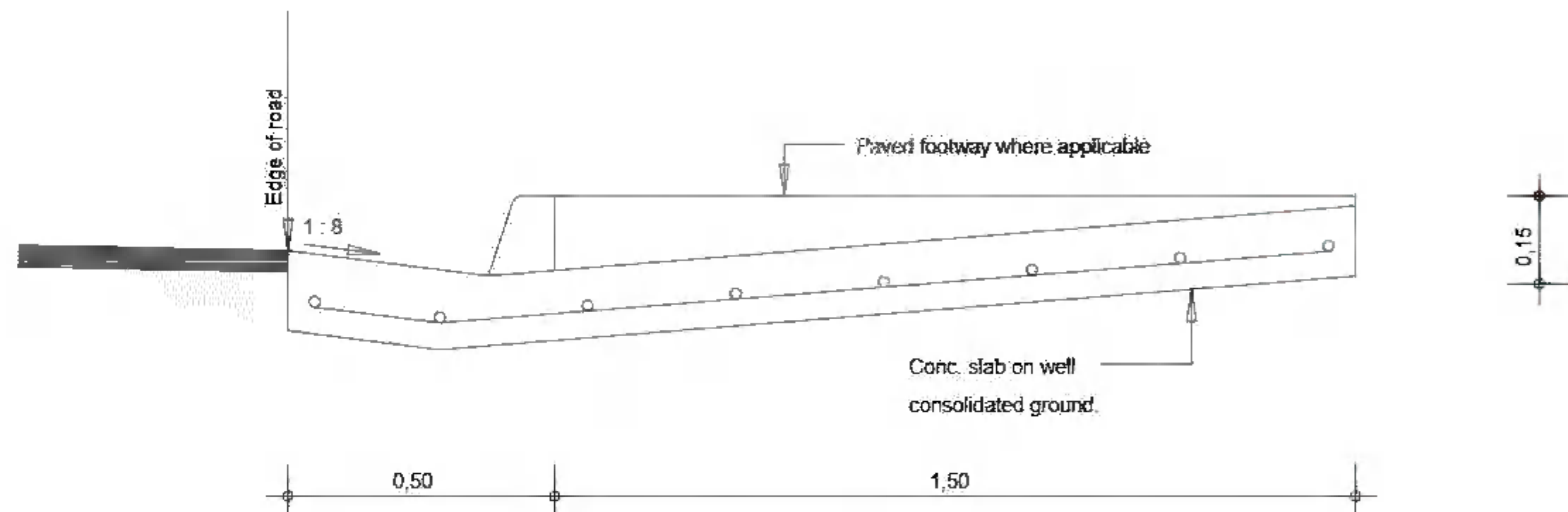
LAYOUT OF BRICKWORK



TYPE C1 STANDARD URBAN ACCESS



SECTION Y-Y



SECTION X-X

REV. NO. DATE DESCRIPTION

CLIENT DEPARTMENT SIGNATURES

APPROVED BY

SIGNATURE

Checked by Professional Consultant
A. MANGRAY

Signature:

February 2025
Date:

Consultant



Project
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)

Drawing description

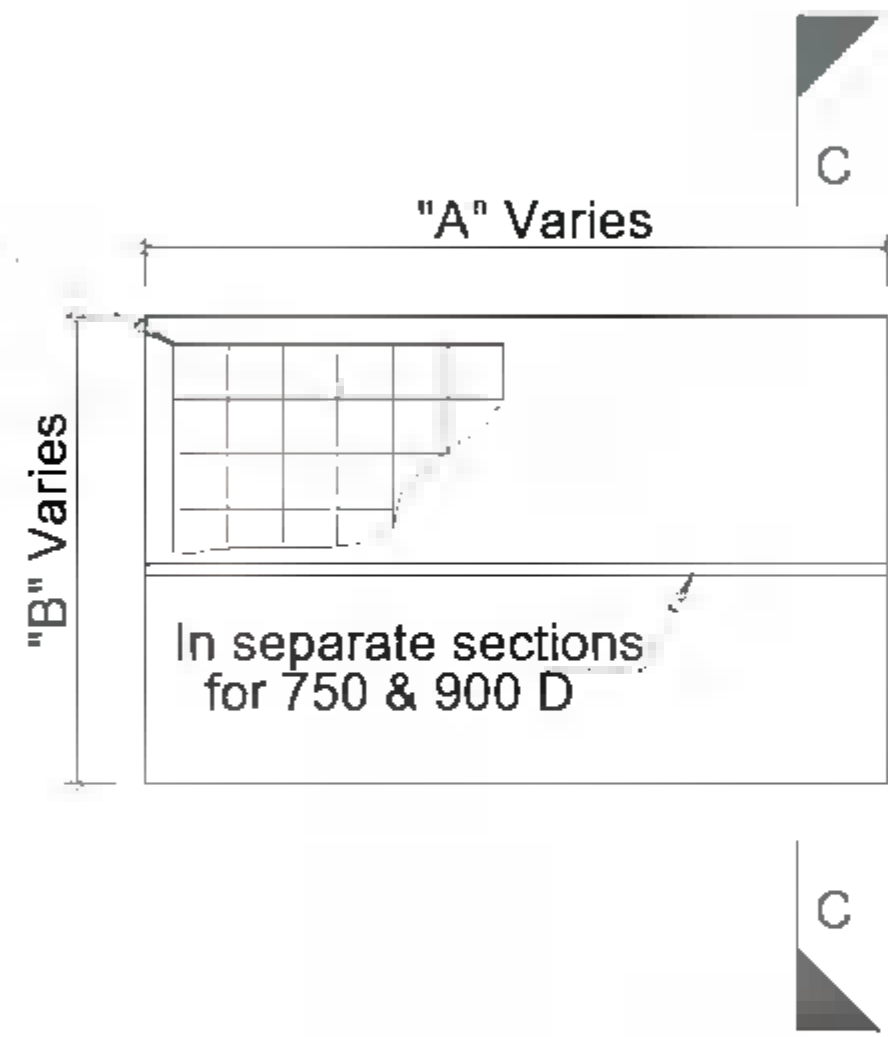
URBAN ACCESS AND HEADWALL
STANDARD DETAIL

Drawn: J RAMGHULAM
Scale(s): N.T.S.
Consultant Drawing number: V45-06-05-004-UADET-T-00
Client Drawing number:
Date: AUGUST 2026
Sheet No.:
Sheet 1 of 1
Drawing Size: A0

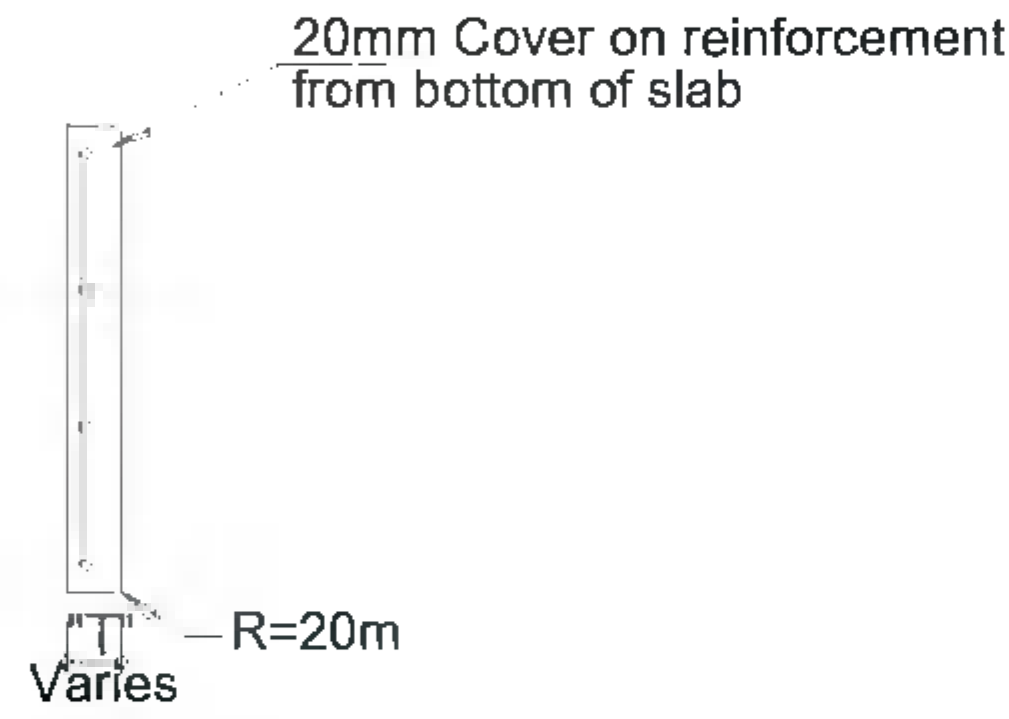
TENDER DRAWING

PIPE "D" (mm)	DIMENSIONS				COVER SLAB IN SECTIONS NO
	"A"	"B"	"T"	H	
450	1125	950	75	750	1
600	1350	1100	100	950	1
750	1575	1250	125	1150	2
900	1800	1400	150	1325	3

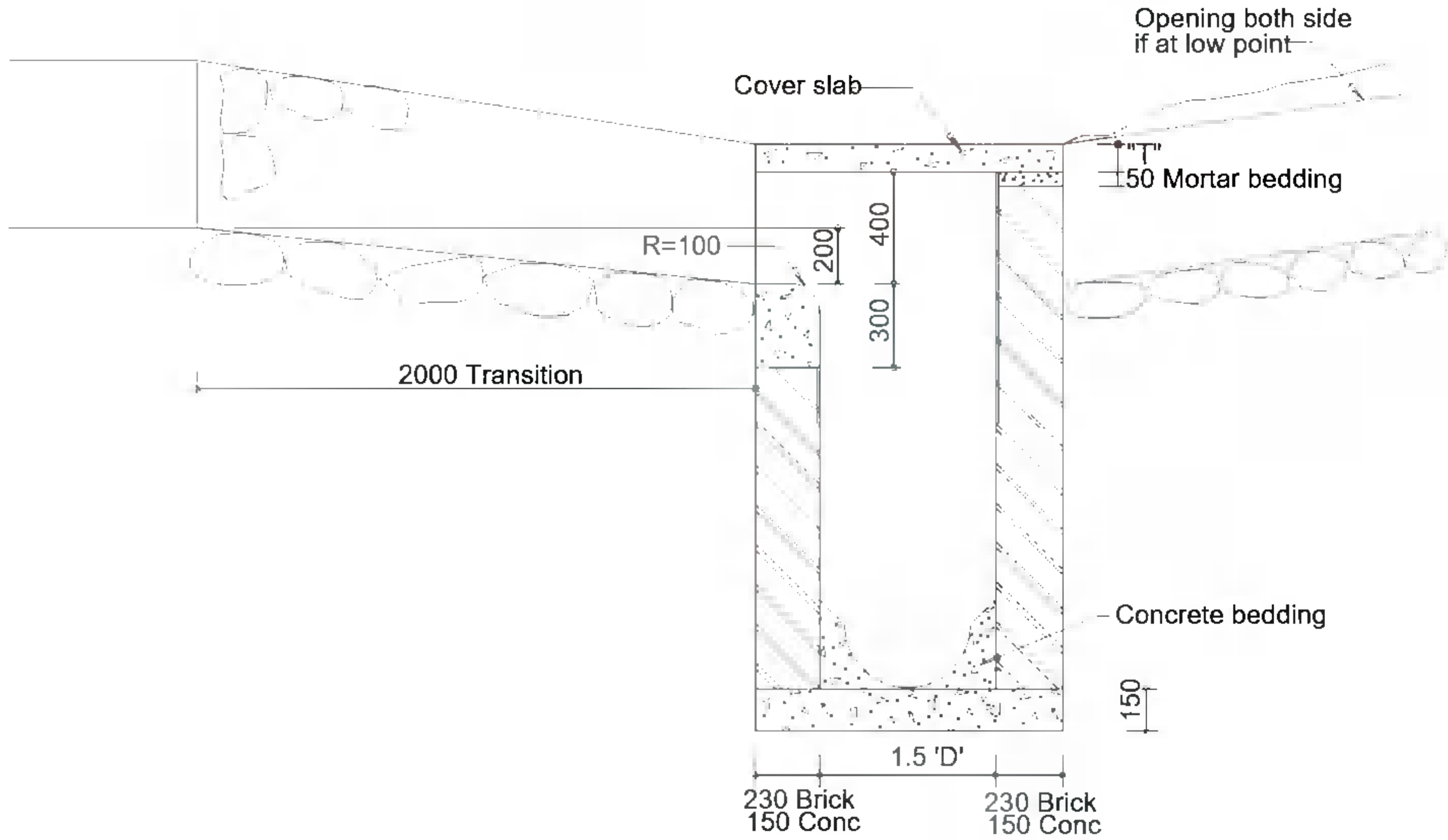
Welded square mesh
fabric no.617 i.e. 10mm
bars at 200mm x 200mm c/c



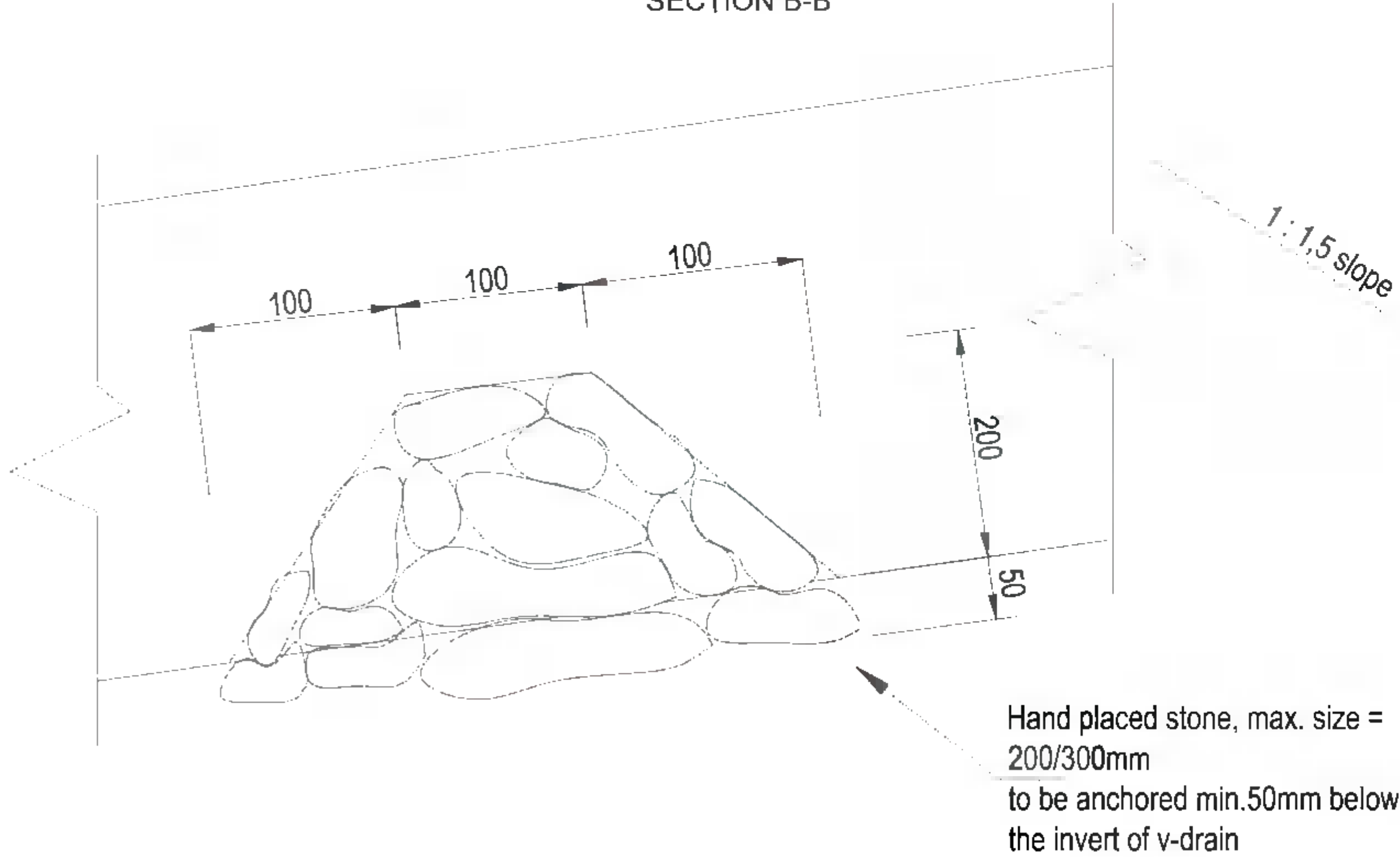
COVER SLAB DETAILS



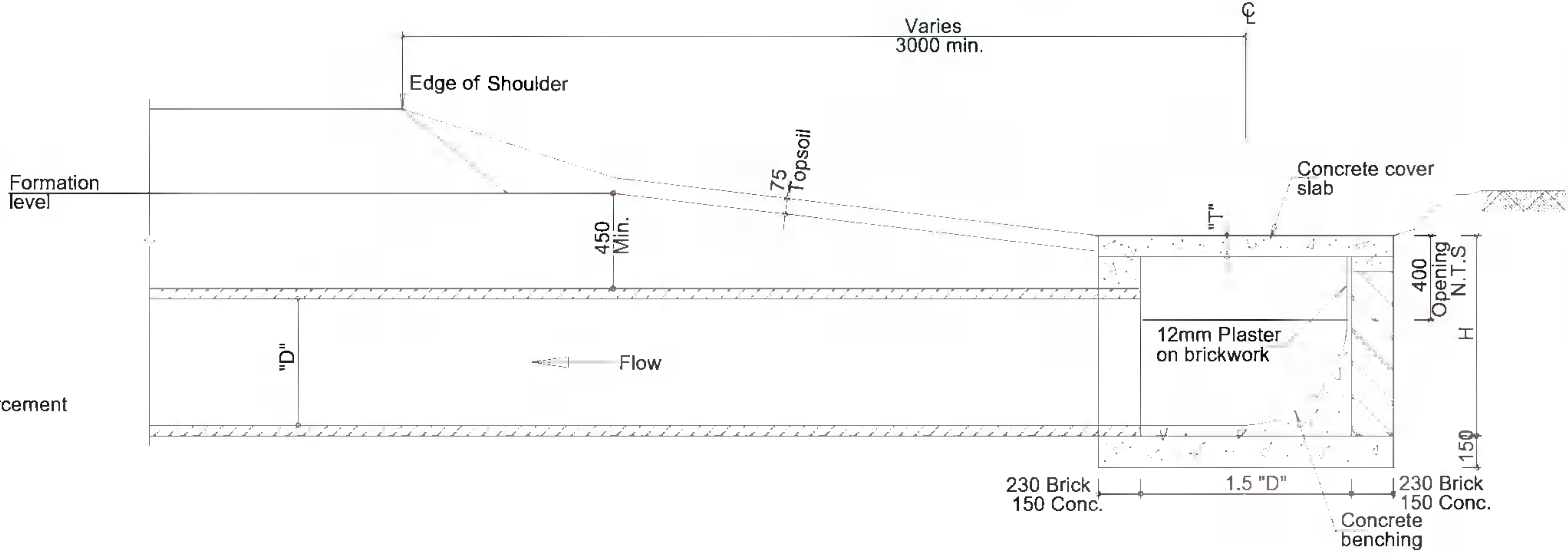
SECTION C - C



SECTION B-B

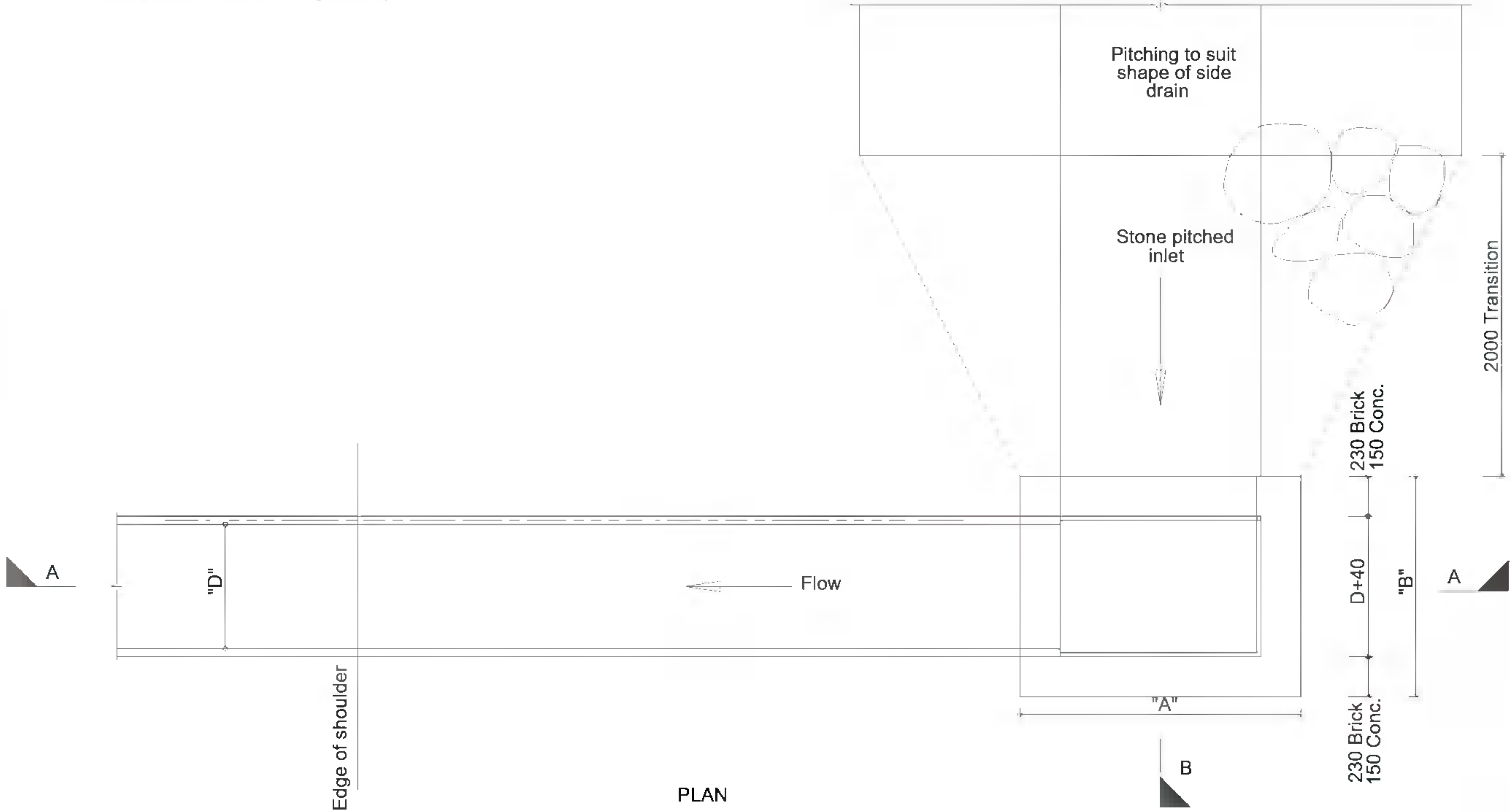


SECTION A-A

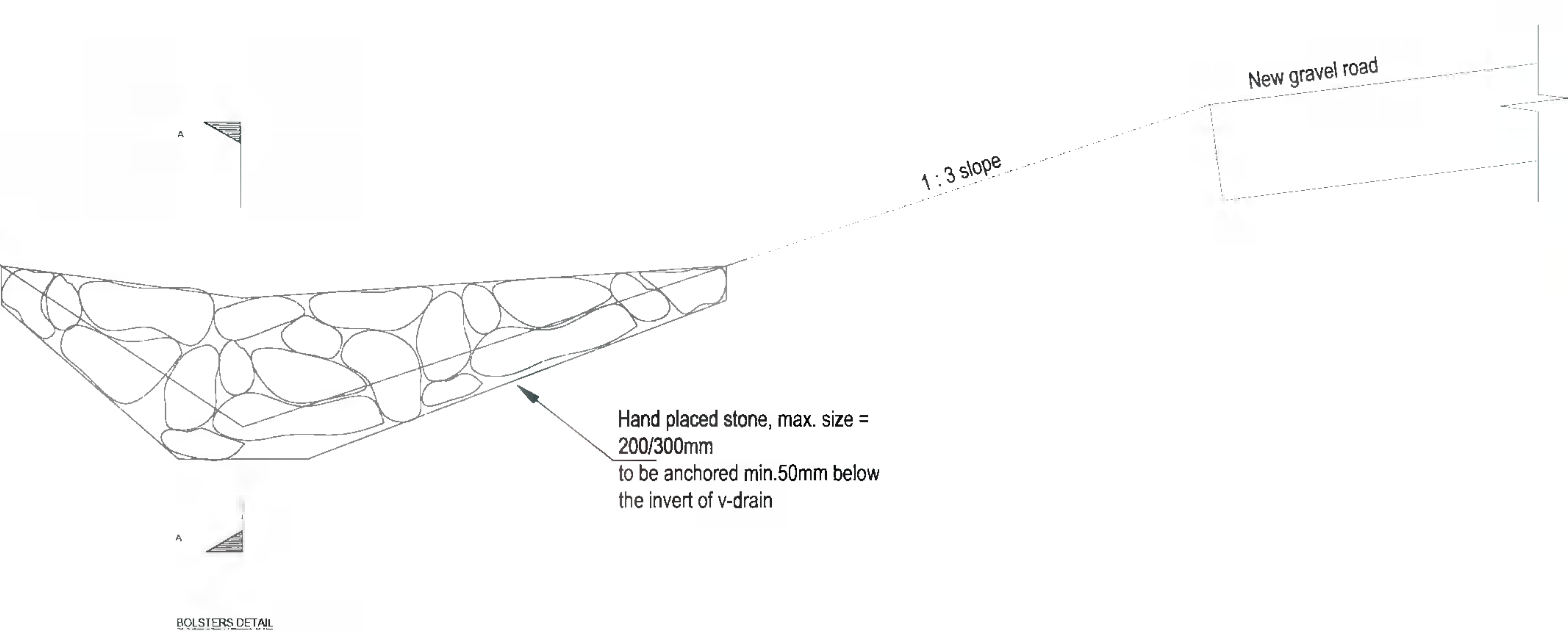


SECTION A-A

NOTE :
1. Minimum concrete strength 20Mpa.



PLAN



BOLSTERS DETAIL

REV. NO. DATE DESCRIPTION

CLIENT DEPARTMENT SIGNATURES

APPROVED BY

SIGNATURE

Checked by Professional Consultant
A. MANGRAY

Signature: February 2025 Date:

Consultant



Project
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works and Effluent Main (Phase 2)

Drawing description
DEPRESSED INLET AND ROCK BOLSTERS STANDARD DETAIL

Drawn: J RAMGHULAM Date: AUGUST 2026
Scale(s): N.T.S. Sheet No.: 1 of 1
Consultant Drawing number: V45-06-05-SDET-T-00 Drawing Size: A0
Client Drawing number:



CURING METHOD - MEMBRANE CURING

- IMMEDIATELY AFTER THE SURFACE FINISHING OPERATIONS HAVE BEEN COMPLETED THE ENTIRE SURFACE OF THE NEWLY PLACED CONCRETE SHOULD BE CURED.
- CURING IS TO BE DONE BY MEANS OF APPLYING A SUITABLE ATOMIZED SPRAY OF AN APPROVED WHITE-PIGMENTED RESIN-BASED OR CHLORINATED-RUBBER BASED, MEMBRANE-FORMING COMPOUND.
- THE CURING COMPOUND IS TO BE SPRAYED UNIFORMLY AS A FINE FOG OVER THE SURFACE SO THAT THE FINISHED SURFACE APPEARANCE OF THE FRESH CONCRETE IS NOT MARRED OR DAMAGED. SPRAY NOZZLES SHOULD BE EQUIPPED WITH WIND GUARDS AND Drip PANS TO ENSURE UNIFORM APPLICATION. NO DRIPPING OF CURING COMPOUND ONTO THE PAVEMENT IS PERMITTED.
- THE CURING COMPOUND IS TO BE APPLIED AT A RATE AS PER THE SUPPLIER'S SPECIFICATIONS.
- THE CURING COMPOUND IS TO BE CONTINUOUSLY STIRRED TO KEEP THE PIGMENTATION IN SUSPENSION.
- THE CURING MEMBRANE SHALL BE MAINTAINED INTACT OVER THE SURFACE FOR AT LEAST 7 DAYS AFTER THE CONCRETE HAS BEEN PLACED. ANY DAMAGE TO THE CURING MEMBRANE SHALL BE REPAIRED BY HAND SPRAYING THE AFFECTED AREAS.
- NO CURING COMPOUND IS TO BE APPLIED OVER THE CONSTRUCTION JOINTS WHICH MAY REDUCE BONDING OF THE SEALANT TO THE CONCRETE FACE.

