CONTRACT NO: VCW410/WINWTW/25

VOLUME 2 – FINANCIAL PROPOSAL

VAAL CENTRAL WATER

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

PROCUREMENT DOCUMENT

MAY 2026

TENDER SUBMITTED BY:

Registered Name of Company: .....

Address: .....

Telephone Number: .....

Fax Number: .....

E-mail: .....

Issued by:
VAAL CENTRAL WATER
PO Box 30121
Pellissier
9322

ISSUE DATE: **FRIDAY, 22 MAY 2026**

BRIEFING SESSION: THURSDAY, 4 JUNE 2026 (COMPULSORY)

CLOSING DATE: **FRIDAY, 19 JUNE 2026**

VAAL CENTRAL WATER

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TENDERER	
	(Name of Tenderer)
TELEPHONE	**FAX**
TOTAL PRICE (Incl. VAT) **Note: The Total Price stated in this page shall correspond with the Form of Offer and Acceptance amount**	
	(in words)
	(in words)
	(in figures)
COMPLETION PERIOD	
	(weeks)

PREFERENCES CLAIMED FOR:				
LOCAL ENTERPRISE:	YES		NO	

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

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VOLUME 2: FINANCIAL PROPOSAL

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END OF SECTION

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

VAAL CENTRAL WATER

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UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

PART C1: AGREEMENTS AND CONTRACT DATA

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VAAL CENTRAL WATER

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UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C1.1: FORM OF OFFER AND ACCEPTANCE

FORM OF OFFER AND ACCEPTANCE OFFER

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

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

The Tenderer, identified in the Offer signature block, has examined the documents listed in the Tender Data and addenda thereto as listed in the Tender 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
Contract No: VCW410/WINWTW/25

…….

…… (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.

Signatures
Name(s)
Capacity

For the Tenderer……

Name and address of organisation:

Name & Signature of witness……Date…….

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

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 T1	Tendering Procedures
Part T2	Returnable documents
Part C1	Agreements and Contract Data, (which includes this agreement)
Part C2	Pricing Data
Part C3	Scope of Work
Part C4	Drawings

and drawings and documents or parts thereof, which may be incorporated by reference into Parts C1 to C4 above.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules as well as any changes to the terms of the Offer agreed by the Tenderer and the Employer during this process of Offer and Acceptance, are contained in the Schedule of Deviations attached to and forming part of this Agreement. No amendments to or deviations from said documents are valid unless contained in this Schedule, which must be duly signed by the authorised representative(s) of both parties.

The Tenderer shall within two weeks after receiving a completed copy of this Agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data, or just after the date this Agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this Agreement.

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

Signatures

Name(s)

Capacity

.....

Name and address of organisation

Name & Signature of witness:.....Date:.....

SCHEDULE OF DEVIATIONS

Notes:

1. The extent of deviations from the Tender Document issued by the Employer prior to the Tender closing date is limited to those permitted in terms of the Conditions of Tender.
2. The Tenderer covering letter shall form part of the final Contract Document. Should any matter in such letter, which constitutes a deviation as aforesaid become the subject of agreements reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here.
3. Any other matter arising from the process of Offer and Acceptance either as a confirmation, clarification or change to the Tender Documents and which it is agreed by the Parties becomes an obligation of the Contract shall also be recorded here.
4. Any change or addition to the Tender Documents arising from the above agreements and recorded here shall also be incorporated into the final draft of the Contract.

1. **Subject** .....

   Details .....

2. **Subject** .....

   Details .....

3. **Subject** .....

   Details .....

4. **Subject** .....

   Details .....

5. **Subject** .....

   Details .....

6. **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 the amendments to the documents listed in the Tender Data and Addenda thereto as listed in the Tender Schedules, as well as any confirmation, clarification or change to the terms of the offer agreed by the Tenderer and the Employer during this process of Offer and Acceptance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

It is expressly agreed that no other matter whether, 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.

VAAL CENTRAL WATER

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UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C1.2: CONTRACT DATA

VAAL CENTRAL WATER

CONTRACT NO: VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

CONTRACT DATA

GENERAL CONDITIONS OF CONTRACT

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

The General Conditions of Contract are not bound into this document but are available at the Contractor's expense from the Secretary of the South African Institution of Civil Engineering, Private Bag X 200, Halfway House, Midrand, 1685.

CONTRACT DATA

In terms of clause 1.1.1.7 of the General Conditions of Contract for Construction Works 3rd Edition (2015), the following Contact Data apply to this Contract.

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

Part 1: Data Provided by the Employer

1.1.1.13	Defects Liability period shall be 12 months
1.1.1.14	The time to achieving Practical Completion should not exceed 10 months
1.1.1.15	The name of the Employer is Central Vaal Water Board
1.1.1.26	The Pricing Strategy is a Re-measurement Contract
1.2.1.2	The address of the Employer is: Supply Chain Management Unit Vaal Central Water 2 Mzuzu Street Bloemfontein Free State 9301 Tel: +27(0) 51 403 0800 Fax: 051 – 422 5333 Email: bids@vcwater.co.za
1.1.1.16	The Employer's Agent is Umzuzo Infrastructure (Pty) Ltd T/A UMZ Consulting
1.2.1.2	The contact details of the Employers are as follows: Umzuzo Infrastructure (Pty) Ltd T/A UMZ Consulting Mr Mxolisi K. Ntshangase Regus Business Centre, Ground Floor, Unipark Building Vodacom Lane, Nobel Street, Bloemfontein 9301 Tel: +27 33 348 2929 Email: mxolisi@umzuzo.co.za

2.4.1	**<u>Delete the contents of the clause and insert the following:</u>** The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence, listed from highest to lowest priority: (a) Form of Offer and Acceptance (b) Contract Data (c) General Conditions of Contract (d) Drawings (e) Variations and Additional Clauses to Particular Specifications and Standard Specifications (f) Particular Specifications (g) Standard Specifications (h) Bill of Quantities (i) Service Level Agreement (j) Any other documents forming part of the Contract If an ambiguity or discrepancy between the documents is found, the Employer's Agent shall provide the necessary clarification or instruction.
3.2.3	The Employer's Agent shall obtain specific approval from the Employer before executing any of his functions or duties according to the following Clauses of the General Conditions of Contract: **1.** **<u>New Clause 3.2.3.2</u>** For expenditure on the Contract to exceed the Contract Sum **2.** **<u>Existing Clauses:</u>** 5.12 - Granting of extension of time excluding Clause 5.12.2.2 (Abnormal climatic conditions) 5.13 - Reduction of penalty for delay. 5.14.2 - The issue of a Certificate of Practical Completion. 5.14.4 - The issue of a Certificate of Completion. 5.16.1 - The issue of a Final Approval Certificate. 6.3 – All Variations 6.6 - Instruction to expend on Provisional and Prime Cost Sums 6.11 - Adjustment of General Items & Approval of Claims

	8.2.2.2 - Order to repair and make good damage arising from any "excepted" risk.

3.2.4	The Employer's Agent has not been appointed as Agent in terms of Occupational Health and Safety on this contract. The Client will perform the duties of the Client, in terms of the Construction Regulations, 2014 as promulgated in terms of Section 43 of the Occupational Health and Safety Act, 1993.
4.3.1	**Add the following to the clause:** For construction works the Basic Conditions of Employment Act of 1997 (Act No 75 of 1997) shall apply and the minimum employment conditions which will apply shall be guided by the latest Sectorial Determination: Civil Engineering Sector published from time to time. Compliance with the National Environmental Management Act (NEMA), Act 107 of 1998. The Contractor shall comply with the Occupational Health and Safety Specification prepared by the Employer in terms of the Construction Regulations, 2014 promulgated in terms of Section 43 of the Occupational Health and Safety Act (Act No. 85 of 1993). Without limiting the Contractor's obligations in terms of the Contract, the Contractor shall before commencement of the Works or any part thereof, be in the possession of an approved Health and Safety Plan.
4.3.2	**Add the following to the clause:** Failure to provide such proof shall entitle the Employer to withhold any payment due to the Contractor until such proof is provided.
4.4.2	The Contractor shall submit the names of all subcontractors to the Employer's Agent for approval. Such approval shall not transfer any liabilities from the Contractor to any other party.
4.4.4	**Add the following to the clause:** The Employer shall require the Contractor to appoint subcontractors and local enterprises as per this clause called "LEP Subcontractors" to a minimum value of 30% of the final Contract Price (excludes VAT & CPA) by the Contractor. It is the Contractor's responsibility to ensure that this target is achieved, irrespective of any sums allowed for LEP work in the BoQ, which are only estimates. No additional mark-up or costs will be payable to the Contractor for this other than under the relevant items of the BoQ, the tendered rate which shall cover all costs including but not limited to management, administration, overheads, risk and profit for the work done under this clause.
4.10.2	The dates for the information to be provided will be communicated to the Contractor during the Site Handover Meeting. Late and/or incomplete information will be penalised at a rate of R 1,000.00 per day.

5.2.1	The commencement date shall be the date one week (7 calendar days) after the Confirmation of Receipt referred to in the form of Offer and Acceptance has been signed for by the Contractor.
5.3.1	**The documentation required before Commencement of the Works are:** Health and Safety Plan Approval (Refer to Clause 4.3) CV and Qualifications of Construction Manager Occupational Health and Safety Agreement (Refer to Clause 4.3) Initial Programme (Refer to Clause 5.6) Security (Refer to Clause 6.2) Proof of Insurance (Refer to Clause 8.6) Letter of Good Standing (Refer to Clause 4.3) BCCEI membership and good standing (Refer to Clause 4.3) Local Economic Participation Plan as per Returnable schedule T2.2.14 Project Quality Control Plan (Refer to Clause 7)
5.3.2	The Contractor is required, within 14 days of the Commencement Date, to submit the documents listed above in Clause 5.3.1 to the Employer's Agent for his approval. Health and Safety Plan The Contractor shall deliver his health and safety plan, in terms of Clause 5(1) of the Construction Regulations (2014). Initial Programme The Contractor shall deliver his Initial Programme of work in terms of Clause 5.6 Security Submit a guarantee of an Insurance Company or Bank to be jointly and severally bound with the Contractor for an amount equal to ten per cent (10%) of the Contract Price. The wording of the Guarantee shall be identical to the pro forma provided in Part C1.3 of this tender document. Insurance Submit copies of receipts of registration, or payment for the premiums for the following insurances, as required by the new Clause 8.6 in this Contact Data.
5.4.2	Access to and possession of the site shall not be exclusive to the Contractor insofar as the provisions of Clause 4.8 apply and where ongoing use by the general public is required.

	The Contractor shall bear all costs and charges for special and temporary rights of way required by him in connection with access to the site.

5.5	Due Completion Date is 10 months after the Commencement Date.
5.8.1	Delete the words "between sunset and sunrise" in the first line and replace with "outside normal working hours". Normal working hours shall be those as stated in the applicable Sectoral Determination applicable to a 5 (five) day week. Non-working days are Saturdays and Sundays, and special non-working days are public holidays and official builder's holidays as per the Sectoral Determination.
5.8.1.1	**Add the following to the clause:** The cost of supervision by the Employer's Agent or his representatives outside of normal (Monday to Friday) working hours in accordance with this Clause, shall be to the Contractor's account.
5.12.2.2	**Add the following to the clause:** The time period specified as the time for completion excludes allowances for those days on which it is expected that work, on the critical path items of the works, would be prevented due to weather conditions such as wind, rain falling or the subsequent waterlogged condition. • Allowance should be made for 3 days per month for Oct - Apr. • Allowance should be made for 1 day per month for May - Sept. If the Contractor has been prevented by these weather conditions from working on the critical path items of the works, then he must notify the Employer's Agent in writing. The notification shall be made within five calendar days of the resumption of work. The Employer's Agent shall upon considering all the relevant factors determine the extension of time to be granted. The tendered sums of the appropriate time-related items shall be increased to take account of the extensions of time granted.
5.12.5	**Add the following to the clause:** A delay in so far as extension of time is concerned, will be regarded as a delay only if, on a claim by the Contractor in accordance with the General Conditions of Contract, the Employer's Agent rules that all progress on an item or items of work on the critical path of the approved programme for the execution of the Works by the Contractor, has been brought to a halt. Delays on normal working days only, based on a working week, of five normal working days, will be taken in account for the extension of time.
5.13.1	The penalty for failing to complete the Works is R 15 000.00 per calendar day
5.14.1	The completion and acceptance of all works.
5.16.3	The latent defect period is 5 years.

6.2.1	Submit a guarantee of an Insurance Company or Bank to be jointly and severally bound with the Contractor for an amount equal to ten per cent (10%) of the Contract Sum. The wording of the Guarantee shall be identical to the pro forma provided in Section C1.3 of the Contract Data. A Retention Money Guarantee is not permitted.
6.2.2	**Delete Clause 6.2.2 in its entirety.**
6.2.3	The expiry date shall be the date, 30 calendar days after the programmed completion date.
6.5.1.2.3	The maximum percentage allowed to cover overhead charges is: Labour – 10% Materials – 10%
6.8.4	Notwithstanding the above, in the event that a public holiday is proclaimed within 28 days before the closing date for tenderers, no cost other than those that can be claimed under Clause 5.12.3 shall be added to the contract price.
6.9.1	**Add the following to the clause:** "The Contractor shall where practicable before delivery, and in any event not later than 24 hours after delivery to the Site, inform the Employer's Agent of any materials which are not his sole property."
6.10.1.5	The percentage advance on materials on site not yet built into the Permanent Works is 80%, and will only be paid once invoices, delivery slips, and proof of payments have been submitted with the IPC to the Employer's Agent as per this clause and Clause 6.10.2.
6.10.3	Retention monies held will be 10% (Excluding VAT) of payments due up to the limit of retention money which will be 5% of the Contract Sum (Excluding VAT).
6.10.4	Contractor's statement to include ALL relevant information, including calculation sheets and details as required by the Employer's Agent for evaluation. The "7-day period" will commence once ALL information and details have been received. **Replace** the wording "within 28 days" in Clause 6.10.4 with the wording "within 30 days".
6.10.6.2	**Delete this clause and replace with the following new wording:** No interest shall be payable to the Contractor upon any moneys retained or overdue in terms of the Contract.
6.10.8	**Replace** the wording "within 28 days" in Clause 6.10.8 with the wording "within 30 days".
6.10.9	**Replace** the wording "within 28 days" in Clause 6.10.9 with the wording "within 30 days".

7.2.1	**Add at the end of Clause 7.2.1**: "Unless otherwise directed in writing by the Employer's Agent, materials for the Permanent Works shall be new and unused."
7.8.1	In Clause 7.8.1, paragraph 2, line 2, after the words "Defects Liability Period", insert "within the period specified by the Employer's Agent",
8.1.2	The Contractor shall comply with The Environmental Management Programme (EMPr) and all conditions of applicable authorisations, licences and permits. All OHS and Environmental non-conformances / non-compliances based on the monthly audit reports shall be corrected within the period stated in the respective audit report and if not corrected the Contractor shall be liable for penalties as described below: • Non-conformances / non-compliances identified for the first time shall be corrected within the period stated in the respective audit report, and evidence provided to the relevant persons that corrective actions were implemented. • Should the same non-conformances / non-compliances be identified in a following audit (not necessarily consecutive), the Project Manager shall issue a notice of non-conformance / non-compliance to the Contractor, stating the nature and magnitude of the contravention with a copy be provided to the ECO / OHS Agent and it shall be corrected within 48 hours and evidence provided to the relevant persons that corrective actions were implemented. • Should the same non-conformances / non-compliances be identified in a subsequent audit (not necessarily consecutive) to the one mentioned above, it shall be considered an recurring non-conformance / non-compliance, and shall be corrected within 24 hours, as well as be penalised at R 2000.00 per finding, per day that it remains uncorrected and evidence shall be provided to the relevant persons that corrective actions were implemented as well as when they were implemented. • In the case of a non-compliance giving rise to physical damage or destruction of the environment, the ER shall be entitled to undertake such remedial works as may be required to make good such damage and to recover from the Contractor the full costs incurred in doing so. • The ER shall at all times have the right to stop work and/or certain activities on site in the case of non-conformances / non-compliances or failure to implement remediation measures. • The Contractor will incur an immediate penalty of R 50,000.00 for the removal of or damage of any endangered plants or trees, if such removal occurs without written approval of the Employer's Agent. Note that if audited by DEA / DWS or other regulatory body, any first offence / non-conformances / non-compliances could attract prosecutions. Note that these are fines imposed by the Client, and that DEA / DWS or any other regulatory body may impose other fines as well as prosecutions.

8.6.1	The value of Plant and materials supplied by the Employer to be included in the insurance sum is R 0.00. The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is R 200 000.00. A Coupon Policy for Special Risks Insurance issued by the South African Special Risks Insurance Association (SASRIA) is required. The limit of indemnity for liability insurance is R 10 000 000.00 for any single claim, the number of claims to be unlimited during construction and Defects Liability Period. In addition to the insurances required in terms of General Conditions of Contract The following insurances are also required: (a) Insurance of Construction 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. (b) Insurance in terms of the provisions of the Compensation for Occupational injuries and Diseases Act No. 130 of 1993. (c) Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger Liability Indemnity. (d) Where the contract involves manufacturing and/or fabrication of the works or part thereof at premises other than the Site, the Contractor shall satisfy the Employer that all materials and equipment for incorporation in the works are adequately insured during manufacture and/or fabrication. In the event of the Employer having an insurable interest in such works during manufacture or fabrication then such interest shall be noted by endorsement to the Contractor's Policies of Insurance.
8.6.6	The insurance policies and proof of due payment shall be produced to the Employer's Agent within the time stated in Clause 5.3.2.
8.6.7	The Contractor may effect, at his own cost, any insurance additional to that effected by the Employer which he deems necessary in his own interests. The Employer reserves the right to call for full information regarding such insurances.

8.6.8	The insurances to be provided by the Contractor and Sub-Contractor shall be effected with Insurers and on terms approved by the Employer (which approval shall not be unreasonably withheld) and the Contractor shall, if required by the employer, produce to the employer the Policy or Policies of insurance and the receipts for payment of the current premiums. **Add Clause 8.6.8:** "In the event of any claim arising under the policies held in terms of this Clause, the Contractor shall forthwith take all necessary steps to lodge his claim on the joint behalf of himself and the Employer, and to secure settlement of such claim, and he shall submit to the Employer's Agent copies of all claims and associated documents. The claim submitted by the Contractor shall cover the cost of repairing and making good as required by Clauses 8.2.2.1 and 8.2.2.3.".
8.6.9	If the Contractor fails to effect and keep in force the insurances referred to, then the employer may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and, from time to time, deduct the amount paid by the Employer from any monies due or which may become due to the Contractor or recover same as a debt from the Contractor.
8.6.10	Where the Contractor is responsible for the appointment of Sub-Contractors, then the Contractor shall: (a) ensure that potential and appointed Sub-Contractors are aware of the whole content of this Special Conditions of Contract Clause; and (b) ensure the compliance of Sub-Contractors with this Special Conditions of Contract clause, where applicable.
8.6.11	The Contractor warrants that he shall give all notices and shall observe all the Terms and Conditions and requirements of all insurances applicable to this Contract.

9.1.4	**<u>Replace Clause 9.1.4 with the following:</u>** Up to the time of termination of the contract by either party in terms of this Clause, or until the Contractor gives notice in terms of this Clause to terminate the contract and the Contractor is precluded from exercising his right to terminate the contract because the Employer agrees to bear any resultant additional costs provided for in Clause 9.1.2.2 hereof, the Contractor: a) will be entitled to an extension of calendar time for working days lost as may be approved by the Employer's Agent, and b) will be reimbursed the cost of delays per working day, where the number of working days will be determined pro rata the effect the delays have on the progress of the work as agreed with the Employer's Agent. Payment in full and final settlement will be made at the rates tendered for the payment items specially provided in the Bill of Quantities Where the circumstances described in Clauses 9.1.1 and 9.1.2 are applicable only to a certain portion of the contract, the Employer's Agent will decide after consulting the Contractor, to what extent the contract as a whole is affected and whether or not a claim in terms of this Clause can be submitted. No payment will be made in terms of this Clause after the expiry of the due completion date.
10.3.2	Amicable settlement in terms of Clause 10.4 shall be contemplated for all disputes prior to referring any dispute to adjudication or arbitration.
10.5.1	Dispute resolution shall be by ad-hoc adjudication
10.5.3	The number of Adjudication Board Members to be appointed is one.
10.7.1	The determination of disputes which are unresolved in terms of Clause 10.5.3 shall be by arbitration.

CPA	PRELIMINARIES AND GENERAL ITEMS (P & G's) P & G's shall be divided as per the BoQ if so divided between Civil, Mechanical and Electrical, else it shall be pro rata divided based on the % of Civil/Mechanical/Electrical relevant to the month during which the certificate is submitted. CIVIL CONTRACT PRICE ADJUSTMENT Replace the definitions of "L"," P","M"," F" with the following: "L" is the "Labour Index" and shall be the "Geographic Index" (CPI per province) for the province in which the site lies, as stated in the Contract Data and as published in the Statistical News Release, P 0151.1, Table A of Statistics South Africa. "P" is the "Plant Index" and shall be the index for "Civil Engineering Plant" as published in the Statistical News Release P 0151.1, Table 4 of Statistics South Africa. "M" is the "Materials Index" and shall be the index for "Civil engineering material: (Excl bitumen)" as published in the Statistical News Release P 0142.1, Table 6 of Statistics South Africa. "F" is the "Fuel Index" and shall be the index for "Diesel fuel" as published in the Statistical News Release P 0142.1, Table 1 of Statistics South Africa. The base month is the month in which the tender enquiry closes plus the validity period. The following values for x, a, b, c and d shall apply: x = 0.15; a = 0.25; b = 0.25; c = 0.45; d = 0.05 MECHANICAL & ELECTRICAL CONTRACT PRICE ADJUSTMENT Adjustments to the Contract Price for the design, manufacture, painting, testing, supply, delivery, offloading and storage of Plant and Materials manufactured in the Republic of South Africa, shall be allowed only for variations in the cost of labour and material based on the indices published by the Steel and Engineering Industries Federation of South Africa (SEIFSA). The following SEIFSA tables shall be regarded as relevant to Mechanical and Electrical Works in this Contract: Table C3 Index of Actual Labour Cost Table G Statistics SA – production price index, Mechanical and Electrical Engineering Materials, as applicable Table Q (A) Index of stainless-steel flats products (excluding imports), Hot rolled steel Table N Ruling price of certain electrical cable manufacturing materials, Copper rod 7,90 mm Supply of Mechanical Plant and Materials

The amount of Contract Price Adjustment (CPA) will be as follows:

$$CPA = PT(1-x)\left[a\frac{(L_1-L_o)}{L_o} + b\frac{(M_1-M_o)}{M_o} + c\frac{(S_1-S_o)}{S_o}\right] \text{ where:}$$

PT = Contract sum for the supply of plant and equipment subject to escalation which sum shall exclude Value Added Tax

x = Portion of the original contract sum to be taken as fixed and therefore not subject to escalation

a = Percentage of contract sum to be taken as that portion that consists of Actual Labour cost

Lo = SEIFSA index of Actual Labour cost (all hourly paid employees) (Table C3) for the month during which tender enquiry closes plus the validity period

L1 = SEIFSA index of Actual Labour cost (all hourly paid employees) (Table C3) for the month during which delivery takes place as specified

b = Percentage of contract sum to be taken as that portion that consists of Mechanical Engineering materials

Mo = SEIFSA index for Mechanical Engineering materials (Table G) for the month during which tender enquiry closes plus the validity period

M1 = SEIFSA index for Mechanical Engineering materials (Table G) for the months during which delivery as specified takes place

c = Percentage of contract sum to be taken as that portion that consists of Stainless-Steel materials

So = SEIFSA index for Stainless Steel materials (Table Q–(A)) for the month during which tender enquiry closes plus the validity period

S1 = SEIFSA index for Stainless Steel materials (Table Q–(A)) for the month during which delivery as specified takes place

The following values for x, a, b and c shall apply:

x = 0.15; a = 0.45; b = 0.35; c = 0.20

	Supply of Electrical Plants and Materials The amount of Contract Price Adjustment (CPA) will be as follows: $CPA = PT(1 - X) \times \left[\frac{C \times (C1 - C0)}{C0} + \frac{M \times (M1 - M0)}{M0} + \frac{L \times (L1 - L0)}{L0}\right]$ where C = Proportion of Contract Price to which the SEIFSA Metal Prices Table F Copper shall apply M = Proportion of Contract Price to which the SEIFSA Index Table G Electrical Engineering Material shall apply L = Proportion of Contract Price to which the SEIFSA Index of Actual Labour cost Metal Prices Table C-3 shall apply C0 = SEIFSA index of Copper Price Table F for the month during which the tender enquiry closes plus the validity period C1 = SEIFSA index of Copper Price Table F for the month the month during which delivery as specified takes place M0 = SEIFSA index of Table G Electrical Engineering Material for the month during which the tender enquiry closes plus the validity period M1 = SEIFSA index of Table G Electrical Engineering Material for the month during which delivery as specified takes place L0 = SEIFSA index of Actual Labour cost (all hourly paid employees) (Table C3) for the month during which the tender enquiry closes plus the validity period L1 = SEIFSA index of Actual Labour cost (all hourly paid employees) (Table C3) for the month during which delivery as specified takes place The following values for X, C, M and L shall apply: X = 0.15 C = 0.20 M = 0.45 L = 0.35

C1.2.4 APPENDIX TO TENDER (continued)
(PART 2 - CONTRACT DATA PROVIDED BY THE CONTRACTOR)

Item	Clause	Entry
Contractor's Name	1.1.1.9	.....
Contractor's Address	1.2.1.2	....
Time for Completion (offered)	5.5.1	..... Months (subject to acceptance by Employer)

Signature .....

On behalf of .....

Date: .....

VAAL CENTRAL WATER

CONTRACT NO. VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

GUARANTEE FOR EXECUTION OF THE CONTRACT

Employer:	Vaal Central Water Office 2 Mzuzu Street Pellissier Bloemfontein	Contractor:	…….. …….. …….. …….. ……..

Amount of Guarantee: To be equal to 10 percent of the Tender Sum

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I/WE the undersigned, duly acting on behalf of the Company that is described below, do hereby bind the said Company to the Employer that is described above, as surety or co-principal debtor in solidum for the due performance, fulfilment and completion of the Contract by the Contractor that is described above, and we hereby undertake, on behalf of the Company to pay on demand at the above-mentioned address

- any loss or damage which the Employer may sustain
- as well as any penalties or claims and legal costs to which the Employer may become entitled by reason of the non-fulfilment or breach of the terms of the Contract by the Contractor

always provided that the liability of the Company under this guarantee shall not exceed the guaranteed amount that is described above.

On behalf of the Company, I/we do hereby renounce all benefits from the legal exceptions non numeratae pecuniae, non- causa debiti excussionis et divisionis and all other exceptions which might or could be pleaded against the validity of this guarantee, the meaning whereof we declare ourselves to be fully acquainted with.

On behalf of the Company, I/we do hereby agree that this guarantee shall be irrevocable and shall remain in full force and effect during the term of the Contract, either until the date of issue of a Certificate of Completion for the whole or the final portion of the Works by the Engineer, or until any liability of the Contractor which has arisen before such date in terms of the Conditions of Contract has been satisfied, whichever is the later.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

I/we do further agree and declare

- that all admissions and acknowledgements of indebtedness by the Contractor shall be binding on the Company,
- that the indebtedness of the Contractor to the Employer shall at all times be determined and proved by a written certificate of the Chief Executive Officer, or by any other person acting in such capacity,
- that such certificate shall be binding on the Company and shall be conclusive proof of the amount of the Company's indebtedness, and that such certificate annexed to this guarantee will be valid as a liquid document against the Company in a competent court in the Republic of South Africa,
- that the Employer shall, without reference and/or notice to us, have complete liberty of action to act in any manner authorised and/or contemplated by the terms of the Contract, and/or to agree to any modifications, variations or alterations to the Works, or to any extensions of the Due Completion Date for the Works under the Contract, and that the rights of the Employer under this guarantee shall in no way be prejudiced nor the liability of the Company be in any way reduced by reason of any steps or concessions which the Employer may take, make, give, concede or agree to under the Contract.
- that the Employer shall be entitled, without prejudice to any of its rights under this guarantee, to give time to and compound with release from liability or to make any other arrangement with the Contractor, its assigns, its liquidators or its judicial managers, and that any such actions shall not exonerate the Company from any portion of its liability under this guarantee.
- this guarantee is neither negotiable nor transferable, purports to the payment of money only and should be returned to the Company upon payment, completion or cancellation whichever occurs earlier.

Name of Company: _____

The Company chooses as its *domicilium citandi et executandi*, and for the purpose of the service of any notices and legal processes the following address:

Address to be entered _____

THUS DONE AND SIGNED AT_____on_____ 20_____.

On behalf of the Company _____

In his capacity as _____

On behalf of the Company _____

In his capacity as _____

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

In the presence of the following witnesses:

Witness No 1:

_____	_____
Name	Signature

Witness No 2:

_____	_____
Name	Signature

General Conditions of Contract

1. Definitions

1. The following terms shall be interpreted as indicated:

1.1 "Closing time" means the date and hour specified in the bidding documents for the receipt of bids.

1.2 "Contract" means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.3 "Contract price" means the price payable to the supplier under the contract for the full and proper performance of his contractual obligations.

1.4 "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.

1.5 "Countervailing duties" are imposed in cases where an enterprise abroad is subsidized by its government and encouraged to market its products internationally.

1.6 "Country of origin" means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.

1.7 "Day" means calendar day.

1.8 "Delivery" means delivery in compliance of the conditions of the contract or order.

1.9 "Delivery ex stock" means immediate delivery directly from stock actually on hand.

1.10 "Delivery into consignees store or to his site" means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the supplies are so delivered and a valid receipt is obtained.

1.11 "Dumping" occurs when a private enterprise abroad market its goods on own initiative in the RSA at lower prices than that of the country of origin and which have the potential to harm the local industries in the RSA.

1.12 ” Force majeure” means an event beyond the control of the supplier and not involving the supplier’s fault or negligence and not foreseeable. Such events may include, but is not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

1.13 “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the bidder of the benefits of free and open competition.

1.14 “GCC” means the General Conditions of Contract.

1.15 “Goods” means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.

1.16 “Imported content” means that portion of the bidding price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the supplies covered by the bid will be manufactured.

1.17 “Local content” means that portion of the bidding price which is not included in the imported content provided that local manufacture does take place.

1.18 “Manufacture” means the production of products in a factory using labour, materials, components and machinery and includes other related value-adding activities.

1.19 “Order” means an official written order issued for the supply of goods or works or the rendering of a service.

1.20 “Project site,” where applicable, means the place indicated in bidding documents.

1.21 “Purchaser” means the organization purchasing the goods.

1.22 “Republic” means the Republic of South Africa.

1.23 “SCC” means the Special Conditions of Contract.

1.24 "Services" means those functional services ancillaries to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance and other such obligations of the supplier covered under the contract.

1.25 "Written" or "in writing" means handwritten in ink or any form of electronic or mechanical writing.

2. Application

2.1 These general conditions are applicable to all bids, contracts and orders including bids for functional and professional services, sales, hiring, letting a n d the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.

2.2 Where applicable, special conditions of contract are also laid down to cover specific supplies, services or works.

2.3 Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.

3. General

3.1 Unless otherwise indicated in the bidding documents, the purchaser shall not be liable for any expense incurred in the preparation and submission of a bid. Where applicable a non-refundable fee for documents may be charged.

3.2 With certain exceptions, invitations to bid are only published in the Government Tender Bulletin. The Government Tender Bulletin may be obtained directly from the Government Printer, Private Bag X 85, Pretoria 0001, or accessed electronically from www.treasury.gov.za

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

5. Use of contract documents and information inspection

5.1 The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

5.2 The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause 5.1 except for purposes of performing the contract.

5.3 Any document, other than the contract itself mentioned in GCC clause 5.1 shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so, required by the purchaser.

5.4 The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so, required by the purchaser.

6. Patent rights

6.1 The supplier shall indemnify the purchaser against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the goods or any part thereof by the purchaser.

7. Performance security

7.1 Within thirty (30) days of receipt of the notification of contract award, the successful bidder shall furnish to the purchaser the performance security of the amount specified in SCC.

7.2 The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.

7.3 The performance security shall be denominated in the currency of the contract, or in a freely convertible currency acceptable to the purchaser and shall be in one of the following forms:

(a) a bank guarantee or an irrevocable letter of credit issued by a reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or
(b) a cashier's or certified cheque

7.4 The performance security will be discharged by the purchaser and returned to the supplier not later than thirty (30) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified in SCC.

8. Inspections, tests and analyses

8.1 All pre-bidding testing will be for the account of the bidder.

8.2 If it is a bid condition that supplies to be produced or services to be rendered should at any stage during production or execution or on completion be subject to inspection, the premises of the bidder or contractor shall be open, at all reasonable hours, for inspection by a representative of the Department or an organization acting on behalf of the Department.

8.3 If there are no inspection requirements indicated in the bidding documents and no mention is made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.

8.4 If the inspections, tests and analyses referred to in clauses 7.5 show the supplies to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.

8.5 Where the supplies or services referred to in clauses 7.5 do not comply with the contract requirements, irrespective of whether such supplies or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.

8.6 Supplies and services which are referred to in clauses 7.5 and which do not comply with the contract requirements may be rejected.

8.7 Any contract supplies may on or after delivery be inspected, tested or analyzed and may be rejected if found not to comply with the requirements of the contract. Such rejected supplies shall be held at the cost and risk of the supplier who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with supplies which do comply with the requirements of the contract. Failing such removal the rejected supplies shall be returned at the suppliers cost and risk. Should the supplier fail to provide the substitute supplies forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected supplies, purchase such supplies as may be necessary at the expense of the supplier.

8.8 The provisions of clauses 8.4 to 8.6 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 9.2 of GCC.

9. Packing

9.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size and weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, specified in SCC, and in any subsequent instructions ordered by the purchaser.

10. Delivery and documents

10.1 Delivery of the goods shall be made by the supplier in accordance with the terms specified in the contract. The details of shipping and/or other documents to be furnished by the supplier are specified in SCC.

10.2 Documents to be submitted by the supplier are specified in SCC.

11. Insurance

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

12. Transportation

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

13. Incidental services

13.1 The supplier may be required to provide any or all of the following services, including additional services, if any, specified in SCC:

(a) performance or supervision of on-site assembly and/or commissioning of the supplied goods.
(b) furnishing of tools required for assembly and/or maintenance of the supplied goods.
(c) furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods.
(d) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and
(e) training of the purchaser's personnel, at the supplier's plant and/or on site, in assembly, start-up, operation, maintenance, and/or repair of the supplied goods.

13.2 Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.

14. Spare parts

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

(a) such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract; and

(b) in the event of termination of production of the spare parts:

(i) Advance notification to the purchaser of the pending termination, in sufficient time to permit the purchaser to procure needed requirements; and

(ii) following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

15. Warrant

15.1 The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.

15.2 This warranty shall remain valid for twelve (12) months after the goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for eighteen (18) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise in SCC.

15.3 The purchaser shall promptly notify the supplier in writing of any claims arising under this warranty.

15.4 Upon receipt of such notice, the supplier shall, within the period specified in SCC and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.

15.5 If the supplier, having been notified, fails to remedy the defect(s) within the period specified in SCC, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract

16. Payment

16.1 The method and conditions of payment to be made to the supplier under this contract shall be specified in SCC.

16.2 The supplier shall furnish the purchaser with an invoice accompanied by a copy of the delivery note and upon fulfilment of other obligations stipulated in the contract.

16.3 Payments shall be made promptly by the purchaser, but in no case later than thirty (30) days after submission of an invoice or claim by the supplier.

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

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

18. Contract amendments

18.1 No variation in or modification of the terms of the contract shall be made except by written amendment signed by the parties concerned.

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

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

21. Delays in the supplier's performance

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

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

21.3 No provision in a contract shall be deemed to prohibit the obtaining of supplies or services from a national department, provincial department, or a local authority.

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

21.5 Except as provided under GCC Clause 7.5.4, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 5.13, unless an extension of time is agreed upon pursuant to GCC Clause 5.12 without the application of penalties.

21.6 Upon any delay beyond the delivery period in the case of a supplies contract, the purchaser shall, without cancelling the contract, be entitled to purchase supplies of a similar quality and up to the same quantity in substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and without prejudice to his other rights, be entitled to claim damages from the supplier.

22. Penalties

22.1 Subject to GCC Clause 5.5.1, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, a sum calculated on the delivered price of the delayed goods or unperformed services using the current prime interest rate calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 9.2.

23. Termination for default

23.1 The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:

(a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 9.2;
(b) if the Supplier fails to perform any other obligation(s) under the contract; or
(c) if the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

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

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

23.4 If a purchaser intends imposing a restriction on a supplier or any person associated with the supplier, the supplier will be allowed a time period of not more than fourteen (14) days to provide reasons why the envisaged restriction should not be imposed. Should the supplier fail to respond within the stipulated fourteen (14) days the purchaser may regard the intended penalty as not objected against and may impose it on the supplier.

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

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

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

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

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

24. Anti-dumping and countervailing duties and rights

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

25. Force Majeure

25.1 Notwithstanding the provisions of GCC Clauses 6.2 and 9.2, the supplier shall not be liable for forfeiture of its performance security, damages, or termination for default if and to the extent that his delay in performance or other failure to perform his obligations under the contract is the result of an event of force majeure.

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

26. Termination for insolvency

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

27. Settlement of Disputes

27.1 If any dispute or difference of any kind whatsoever arises between the purchaser and the supplier in connection with or arising out of the contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.

27.2 If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.

27.3 Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.

27.4 Mediation proceedings shall be conducted in accordance with the rules of procedure specified in the SCC.

27.5 Notwithstanding any reference to mediation and/or court proceedings herein,

(a) the parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and

(b) the purchaser shall pay the supplier any monies due the supplier.

28. Limitation of liability

28.1 Except in cases of criminal negligence or wilful misconduct, and in the case of infringement pursuant to Clause 7.8;

(a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser; and

(b) the aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

29. Governing language

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

30. Applicable law

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

31. Notices

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

31.2 The time mentioned in the contract documents for performing any act after such aforesaid notice has been given, shall be reckoned from the date of posting of such notice.

32. Taxes and duties

32.1 A foreign supplier shall be entirely responsible for all taxes, stamp duties, license fees, and other such levies imposed outside the purchaser's country.

32.2 A local supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted goods to the purchaser.

32.3 No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid the Department must be in possession of a tax clearance certificate, submitted by the bidder. This certificate must be an original issued by the South African Revenue Services.

33. National Industrial Participation (NIP) Programme

33.1 The NIP Programme administered by the Department of Trade and Industry shall be applicable to all contracts that are subject to the NIP obligation.

VAAL CENTRAL WATER

CONTRACT NO. VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

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Annexure 3: Notification of Construction Work

Annexure 4: Medical Certificate of Fitness

Annexure 5: Tender System Questionnaire

VAAL CENTRAL WATER

CONTRACT NO. VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

Annexure C: Health and Safety Specification by Employer

1. Issue Control and Distribution

Distribution of Manual

Distribution of the Management System documentation is by controlled master soft copy over the **Vaal Central Water** Intranet.

1.1 Revision Status of Manual

Rev. No	Sect. No	Page No	Detail Of Change	Date	Authorized By
1	All	All	First Issue	02/10/2014	
2	All	All	Second Issue	02/10/2022	
3	All	All	Third Issue	18/09/2024	
4	All	All	Fourth Issue	29/04/2025	

1.2 Revision Status of Procedures

Rev. No	Sect. No	Page No	Detail Of Change	Date	Authorized By
1	All	All	First Issue	02/10/2014	

2	**All**	**All**	**Second Issue**	**02/10/2022**	
3	**All**	**All**	**Third Issue**	**18/09/2024**	
4	**All**	**All**	**Fourth Issue**	**29/04/2025**	

2. Scope

This health and safety specification in respect if an engineering and construction works contract:

a) Provides the overarching framework within which the Contractor is required to demonstrate compliance with certain requirements for occupational health and safety established by the **Occupational Health and Safety Act (Act no. 85 of 1993.**
b) Establishes the manner in which the Contractor shall manage the risk of health and safety incidents in the execution of the contract; and
c) Establishes the manner in which Vaal Central Water's SHEQ Officer will interact with the Contractor.

3. Preamble

Every effort has been made to ensure that this specification is accurate in all respects, however, should it contain any errors or omissions they may not be considered as grounds for claims under the contract for additional reimbursement or extension of time.

4. Purpose

The purpose of this Specification is to brief the contractors on the significant safety aspects of the project. It provides information and requirements on *inter alia:*

a) Safety considerations affecting the site and its environment.
b) Health and safety aspects of the associated structures and equipment.
c) Submissions on health and safety matters; and
d) The contractor's health and safety plan.

NOTE

This specification establishes general requirements and specific requirements to enable Vaal Central Water and the Contractor to satisfy the Occupational Health and Safety Act (Act No.85 of 1993) and the Construction Regulations.

The Construction Regulations, 2014, require Vaal Central Water to stop any Contractor from executing construction work which is not in accordance with the health and safety of persons. This specification establishes site-specific health and safety requirements. Site specific requirements for health and safety are stated in the scope of work associated with a contract.

5. Definitions

Act:
The Occupational Health and Safety Act (Act no. 85 of 1993)

Competent Person:
Any person having the knowledge, training and experience specific to the work or task being performed.

Vaal Central Water's Assistant Manager SHEQ/ Construction Safety Officer:
The person appointed as an agent by Vaal Central Water in terms of Regulation 4(5) of the Construction Regulations and named in the contract data as being Vaal Central Water's agent responsible for health and safety matters.

Ergonomics:
The application of scientific information concerning humans to the design of objects, systems and the environment for human use in order to optimise human wellbeing and overall system performance.

Hazard:
A source of or exposure to danger.

Hazard Identification:
The identification and documenting of existing or expected hazards to the health and safety of persons, which are normally associated with the type of construction work being executed or to be executed.

Healthy:
Free from illness or injury attributable to occupational causes.

Incident:
an event or occurrence occurring at work or arising out of or in connection with the activities of persons at work, or in connection with the use of plant or machinery, in which, or in consequence of which:

a) Any person dies, becomes unconscious, suffers the loss of a limb or part of a limb or is otherwise injured or becomes ill to such a degree that he/she is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or to continue with the activity for which he/she was employed or is usually employed;
b) major incident occurred; or
c) The health or safety of any person was endangered and where:
d) A dangerous substance was spilled;
e) The uncontrolled release of any substance under pressure took place;
f) Machinery or any part thereof fractured or failed resulting in flying, falling or uncontrolled moving objects, or machinery ran out of control.

Inspector:
a person designated as such under section 28 of the Act.

Major Incident:
an occurrence of catastrophic proportions, resulting from the use of plant or machinery, or from activities at a workplace.

Reasonably Practicable:
practice having regard to:

a) The severity and scope of the hazard or risk concerned;
b) The state of knowledge reasonably available concerning that hazard or risk and of any means of removing or mitigating that hazard or risk;
c) The availability and suitability of means to remove or mitigate that hazard or risk; and
d) The cost of removing or mitigating that hazard or risk in relation to the benefits deriving there from;

Registered Person:
a Person registered in terms of the Electrical Installation Regulations.

Risk:
The probability that injury or damage will occur.

Safe:
Free from any hazard.

Scaffold:
any temporary elevated platform and supporting structure used for providing access to and supporting workmen or materials.

Structure:

a) Any building, steel or reinforced concrete structure (not being a building), railway line or siding, bridge, waterworks, reservoir, pipe or pipeline, cable, sewer, sewage works, fixed vessels, road, drainage works, earthworks, dam, wall, mast, tower, tower crane, batching plants, pylon, surface and underground tanks, earth retaining structure or any structure designed to preserve or alter any natural feature, and any other similar structure;
b) Any formwork, false work, scaffold or other structure designed or used to provide support or means of access during construction work; or
c) Any fixed plant in respect of work which includes the installation, commissioning, decommissioning or dismantling and where any such work involves a risk of a person.

Substance:
any premises or place where a person performs work in the course of his/her employment.

Workplace:
any premises or place where a person performs work in the course of his employment.

6. Interpretations
The Act and its associated regulations shall have precedence in the interpretation of any ambiguity or inconsistency between it and this specification. Compliance with requirements of this specification does not necessarily result in compliance with the provisions of the Act.

7. Project Scope Of Work

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

The scope of works includes civil, mechanical, and electrical works as outlined below;

Civil Works:

- Preliminary & General
- General Site Works
- Repair Wolwas Raw Water Pipelines (Provisional)
- Modifications to Wolwas Inlet Chamber
- Replace the raw water rising main to WTW
- Minor Improvements to Raw Water Pump Station
- New Chemical Dosing Building
- Minor Improvements to Inlet Works
- Repair cracks in Clari-flocculator and unblock Sludge Pipe
- Major Refurbishment of Filter Building
- Modifications to Filter Inlet Channel
- Provide New Staff Building
- New Chlorination Building
- Repair or Replace all Leaking Pipes (Provisional)
- New Sludge Holding Pond, Drying Beds, and Wash Water Recovery System

Mechanical and Electrical Works:

- Preliminary and General requirements for Mechanical and Electrical works
- Refurbishment and upgrading of the Bulk Electrical Supply to the WTW
- Replacement of Wolwas Dam raw water pump sets, including pipework and New Electrical Control Panel.
- Improvement of Bulk Electrical Supply at Wolwas Pump Station (Provisional)
- Replacement Raw Water Pump sets at Rietfontein Dam, including pipework, valves and minor modifications to existing electrical panel.
- Replacement of raw water and clear water Flow Meters, including associated pipework, cabling, control and instrumentation.
- Replacement of existing Chemical (flocculant) Dosing System, including tanks, testing and repair of installed pumps, pipework, and electrical controls.
- Refurbishment of the Clari-flocculator rotating bridge, scrapers, and paddle mixers, including the supply of one additional paddle mixer
- Supply and installation of a new sludge (knife-gate) valve, including electric actuator and control system.
- Replacement and Upgrading of the Clari-flocculator Electrical Panel
- Major refurbishment of valves and pipework within the filter building, including modifications to the backwash control system.
- Replacement of Chlorination System, including new equipment housed in a new building, complete with safety systems and controls.
- Replacement of Clear Water Pump-sets, including refurbishment of associated pipework, sump level control, and electrical panel modifications.
- Integration of all pumps and process equipment into the telemetry and basic loss

control system, including level-based pump start/stop and inhibit logic at

- WTW
- Rietfontein Dam pump station
- Wolwas Dam Pumpstation

8. Application for construction work permit

1) A client who intends to have construction work carried out, must at least 30 days before that work is to be carried out apply to the provincial director in writing for a construction work permit to perform construction work if the intended construction work starts from the 7th August 2018 and will -
   a) exceed 365 days and will involve more than 3600 person days of construction work; or the works contract is of a value exceeding thirteen million rand or Construction Industry Development Board (CIDB) grading level 7.
   b) the tender value limit is grade 7, 8 or 9 of the Construction Industry Development Board (CIDB) grading.
2) An application contemplated in sub-regulation (1) must be done in a form similar to Annexure 1.
3) The provincial director must issue a construction work permit in writing to perform construction work contemplated in sub-regulation (1) within 30 days of receiving the construction work permit application and must assign a site-specific number for each construction site.
4) A site-specific number contemplated in Sub-regulation (3) must be conspicuously displayed at the main entrance to the site for which that number is assigned.
5) A construction work permit contemplated in this regulation may be granted only if-
   a) the fully completed documents contemplated in regulation 5 (1) (*a*) and (*b*) have been submitted; and
   b) (*b*) proof in writing has been submitted-
      i. that the client complies with regulation 5 (5)
      ii. with regard to the registration and good standing of the principal contractor as contemplated in regulation 5 (1) (*j*); and
      iii. that regulation 5 (1) (*c*), (*d*), (*e*), (*g*) and (*h*) has been complied with.
6) A client must ensure that the principal contractor keeps a copy of the construction work permit contemplated in subregulation (1) in the occupational health and safety file for inspection by an inspector, the client, the client's authorised agent, or an employee.
7) No construction work contemplated in subregulation (1) may be commenced or carried out before the construction work permit and number contemplated in subregulation (3) have been issued and assigned.
8) A site specific number contemplated in subregulation (3) is not transferrable.

9. Duties and Responsibilities

9.1 Client's Responsibilities (Construction Regulations 5):

1. In terms of Construction regulation 5 a client must-
   a) prepare a baseline risk assessment for an intended construction work project;
   b) prepare a suitable, sufficiently documented and coherent site-specific health and safety specification for the intended construction work based on the baseline risk assessment contemplated in paragraph (a);
   c) provide the designer with the health and safety specification contemplated in paragraph (b);
   d) ensure that the designer takes the prepared health and safety specification into consideration during the design stage;
   e) ensure that the designer carries out all responsibilities contemplated in regulation 6;
   f) include the health and safety specification in the tender documents;
   g) ensure that potential Service Providers / Principal Contractor submitting tenders have made adequate provision for the cost of health and safety measures;
   h) ensure that the Service Provider / Principal Contractor to be appointed has the necessary competencies and resources to carry out the construction work safely;
   i) take reasonable steps to ensure co-operation between all contractors appointed by the client to enable each of those contractors to comply with these Regulations;
   j) ensure before any work commences on a site that every Service Provider / Principal Contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer as contemplated in the Compensation for Occupational Injuries and Diseases Act, 1993 (Act No. 130 of 1993).
   k) appoint every Service Provider / Principal Contractor in writing for the project or part thereof on the construction site;
   l) discuss and negotiate with the Service Provider / Principal Contractor the contents of the Service Provider/Principal Contractor health and safety plan contemplated in regulation 7(1), and must thereafter finally approve that plan for implementation;
   m) ensure that a copy of the Service Provider / Principal Contractor health and safety plan is available on request to an employee, inspector or contractor;
   n) take reasonable steps to ensure that each contractor's health and safety plan contemplated in regulation 7(1)(a) is implemented and maintained;
   o) ensure that periodic health and safety audits and document verification are conducted at intervals mutually agreed upon between the Service Provider / Principal Contractor and any contractor, but at least once every 30 days;
   p) ensure that a copy of the health and safety audit report contemplated in paragraph (o) is provided to the Service Provider / Principal Contractor within seven days after the audit;
   q) stop any contractor from executing a construction activity which poses a threat to the health and safety of persons which is not in accordance with the client's health and safety specifications and the Service Provider's / Principal Contractor health and safety plan for the site;
   r) where changes are brought about to the design or construction work, make sufficient health and safety information and appropriate resources available to the Service Provider / Principal Contractor to execute the work safely; and
   s) ensure that the health and safety file contemplated in regulation 7(1)(b) is kept and maintained by the Service Provider / Principal Contractor.

2. Where a client requires additional work to be performed as a result of a design change or an

error in construction due to the actions of the client, the client must ensure that sufficient safety information and appropriate additional resources are available to execute the required work safely.

3. Where a fatality or permanent disabling injury occurs on a construction site, the client must ensure that the contractor provides the provincial director with a report contemplated in section 24 of the Act, in accordance with regulations 8 and 9 of the General Administrative Regulations, 2014, and that the report includes the measures that the contractor intends to implement to ensure a safe construction site as far as is reasonably practicable.

4. Where more than one Service Provider / Principal Contractor is appointed as contemplated in sub-regulation (1) (k), the client must take reasonable steps to ensure co-operation between all principal contactors and contractors in order to ensure compliance with these Regulations.

5. Where a construction work permit is required as contemplated in regulation 3(1), the client must, without derogating from his or her health and safety responsibilities or liabilities, appoint a competent person in writing as an agent to act as his or her representative, and where such an appointment is made the duties that are imposed by these Regulations upon a client, apply as far as reasonably practicable to the agent so appointed.

6. Where notification of construction work is required as contemplated in regulation 4(1), the client may, without derogating from his or her health and safety responsibilities or liabilities, appoint a competent person in writing as an agent to act as his or her representative, and where such an appointment is made the duties that are imposed by these Regulations upon a client, apply as far as reasonably practicable to the agent so appointed: Provided that, where the question arises as to whether an agent is necessary, the decision of an inspector is decisive.

7. An agent contemplated in sub-regulations (5) and (6) must—
   a) manage the health and safety on a construction project for the client; and
   b) be registered with a statutory body approved by the Chief Inspector as qualified to perform the required functions;
8. When the chief inspector has approved a statutory body as contemplated in sub regulation (7)(b), he or she must give notice of that approval in the Gazette.

Notes 1:

a) Regulation 5(1)d must be read with regulation 6, the duties of the designer and a written report must be submitted to the Client by the Designer as proof of compliance with the afore said regulation.

b) Regulation 5(1)(i) Where there are multiple principle contractors (or contractors) non site appointed by the client , the client shall coordinate cooperation between contractors to ensure health and safety control, read with regulation 7(4). Regulation 5 (5); (6) and (7) .

c) Where a client specifies which contractors a principal contractor must appoint the duties as specified in 7(1)(c)(iii) shall be applicable to the said client.

d) A client may appoint a Construction Health and Safety Agent or Construction Health and Safety Manager based on the scope and risk profile of construction work to represent him/her on matters of health and safety.

Provided that, where the question arises as to whether a Construction Health Safety Agent or a Construction Health and Safety Manager is necessary, the decision of an inspector is decisive.

Notes 2:

a) Refer to exemption issued by the Chief Inspector.

b) The 30 days required to issue a Construction Work Permit is on condition that all correct and fully completed documents are submitted as per the attached 'list of items (not limited to) to be submitted with the construction work permit application'.

c) Where any person aggrieved by any decision taken by an inspector in relation to the application of a Construction Work Permit under a provision of this regulation may appeal against such decision to the chief inspector in terms of Section 35.

d) The Construction Work Permit shall be issued to the Client for whom the Construction work is conducted.

9.2 Designer's Duties (CR 6):

1. The designer of a structure must—
   a) ensure that the applicable safety standards incorporated into these Regulations under section 44 of the Act are complied with in the design;
   b) take into consideration the health and safety specification submitted by the client;
   c) before the contract is put out to tender, make available in a report to the client—
      - all relevant health and safety information about the design of the relevant structure that may affect the pricing of the construction work;
      - the geotechnical-science aspects, where appropriate; and
      - the loading that the structure is designed to withstand;
   d) inform the client in writing of any known or anticipated dangers or hazards relating to the construction work, and make available all relevant information required for the safe execution of the work upon being designed or when the design is subsequently altered;
   e) refrain from including anything in the design of the structure necessitating the use of dangerous procedures or materials hazardous to the health and safety of persons, which can be avoided by modifying the design or by substituting materials;
   f) take into account the hazards relating to any subsequent maintenance of the relevant structure and must make provision in the design for that work to be performed to minimize the risk;
   g) when mandated by the client to do so, carry out the necessary inspections at appropriate stages to verify that the construction of the relevant structure is carried out in accordance with his design: Provided that if the designer is not so mandated, the client's appointed agent in this regard is responsible to carry out such inspections;
   h) when mandated as contemplated in paragraph *(g)*, stop any contractor from executing any construction work which is not in accordance with the relevant design's health and safety aspects: Provided that if the designer is not so mandated, the client's appointed agent in that regard must stop that contractor from executing that construction work;
   i) when mandated as contemplated in paragraph *(g)*, in his or her final inspection the completed structure in accordance with the National Building Regulations, include the health and safety aspects of the structure as far as reasonably practicable, declare the structure safe for use, and issue a completion certificate to the client and a copy thereof to the contractor; and
   j) during the design stage, take cognisance of ergonomic design principles in order to

minimize ergonomic related hazards in all phases of the life cycle of a structure.

2. The designer of temporary works must ensure that—
   a) all temporary works are adequately designed so that it will be capable of supporting all anticipated vertical and lateral loads that may be applied;
   b) the designs of temporary works are done with close reference to the structural design drawings issued by the contractor, and in the event of any uncertainty consult the contractor;
   c) all drawings and calculations pertaining to the design of temporary works are kept at the office of the temporary works designer and are made available on request by an inspector; and (d) the loads caused by the temporary works and any imposed loads are clearly indicated in the design.

Notes:
Regulation 6 (1) (c) - Designers must ensure that designs are accompanied by a report as required in terms of this regulation.

9.3 Principal Contractor Responsibilities

a) The Principal Contractor shall accept the appointment under the terms and Conditions of Contract. The Service Provider / Principal Contractor shall sign and agree to those terms and conditions and shall, before commencing work, notify the Department of Labour of the intended construction work in terms of Regulation 4 of the Construction Regulations 2014. The Principal Contractor shall submit the notification in writing prior to commencement of work and inform the Client or his Agent accordingly;
b) The Principal Contractor shall ensure that he is fully conversant with the requirements of this Specification and all relevant health and safety legislation. This Specification is not intended to supersede the Act nor the Construction Regulations 2014 or any part of either. Those sections of the Act and the Construction Regulations 2014 which apply to the scope of work to be performed by the Principal Contractor in terms of this contract (entirely or in part) will continue to be legally required of the Principal Contractor to comply with. The Principal Contractor will in no manner or means be absolved from the responsibility to comply with all applicable sections of the Act, the Construction Regulations 2014 or any Regulations proclaimed under the Act or which may perceivable be applicable to this contract;
c) (1) The Principal Contractor must further —
   i. provide and demonstrate to the client a suitable, sufficiently documented and coherent site specific health and safety plan, based on the client's documented health and safety specifications contemplated in regulation 5(1)(b), which plan must be applied from the date of commencement of and for the duration of the construction work and which must be reviewed and updated by the Principal Contractor as work progresses;
   ii. open and keep on site a health and safety file, which must include all documentation required in terms of the Act and these Regulations, which must be made available on request to an inspector, the client, the client's agent or a contractor; and on appointing any other contractor, in order to ensure compliance with the provisions of the Act—
      - provide contractors who are tendering to perform construction work for the Principal Contractor, with the relevant sections of the health and safety specifications contemplated in regulation 5(1)(b) pertaining to the

construction work which has to be performed; ensure that potential contractors submitting tenders have made sufficient provision for health and safety measures during the construction process;

- ensure that potential contractors submitting tenders have made sufficient provision for health and safety measures during the construction process;
- ensure that no contractor is appointed to perform construction work unless the Principal Contractor is reasonably satisfied that the contractor that he or she intends to appoint, has the necessary competencies and resources to perform the construction work safely;
- ensure prior to work commencing on the site that every contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer as contemplated in the Compensation for Occupational Injuries and Diseases Act, 1993;
- appoint each contractor in writing for the part of the project on the construction site;
- take reasonable steps to ensure that each contractor's health and safety plan contemplated in sub-regulation (2)(a) is implemented and maintained on the construction site;
- ensure that the periodic site audits and document verification are conducted at intervals mutually agreed upon between the Principal Contractor and any contractor, but at least once every 30 days;
- stop any contractor from executing construction work which is not in accordance with the client's health and safety specifications and the Principal Contractor health and safety plan for the site or which poses a threat to the health and safety of persons;
- where changes are brought about to the design and construction, make available sufficient health and safety information and appropriate resources to the contractor to execute the work safely; and
- discuss and negotiate with the contractor the contents of the health and safety plan contemplated in sub-regulation (2)(a), and must thereafter finally approve that plan for implementation;

d) ensure that a copy of his or her health and safety plan contemplated in paragraph (a), as well as the contractor's health and safety plan contemplated in sub-regulation (2)(a), is available on request to an employee, an inspector, a contractor, the client or the client's agent;

e) hand over a consolidated health and safety file to the client upon completion of the construction work and must, in addition to the documentation referred to in sub-regulation (2)(b), include a record of all drawings, designs, materials used and other similar information concerning the completed structure;

f) in addition to the documentation required in the health and safety file in terms of paragraph(c)(v) and sub-regulation (2)(b), include and make available a comprehensive and updated list of all the contractors on site accountable to the Service Provider / Principal Contractor, the agreements between the parties and the type of work being done; and

g) ensure that all his or her employees have a valid medical certificate of fitness specific to the construction work to be performed and issued by an occupational health practitioner in the form of Annexure 3.

10. Requirements

10.1 General Requirements

a) Create and maintain a safe and healthy work environment,

b) Execute the works in a manner that complies with all the requirements of the Act and all its associated regulations, and in so doing, minimize the risk of incidents occurring; and

a) Respond to notices issued by **Vaal Central Water's Assistant Manager SHEQ/ SHEQ Officer** as follows:

i. Improvement Notice: improve health and safety performance over time so that repeat notices are not issued.
ii. Contravention Notice: rectify contravention as soon as possible.
iii. Prohibition Notice: terminate affected activities with immediate effect and only recommence activities when it is safe to do so.

10.2 PROJECT/SITE SPECIFIC REQUIREMENTS

The following is a list of specific activities and considerations that have been identified for the project and site for which Risk Assessment, Standard Work Procedures (SWP), Management and Control Measures and Method Statements (where necessary) have to be developed by the Principal Contractor:

a) Clearing and grubbing of the area/site.

b) Site establishment including:

- Offices
- Secure/safe storage areas for materials, plant and equipment
- Ablution facilities
- Sheltered dining area
- Vehicle access to the site.

c) Dealing with existing structures.

d) Location of existing services.

e) Installation and maintenance of temporary construction electrical supply, lighting and equipment

f) Adjacent land uses/surrounding property exposures

g) Boundary and access control/public liability exposures (Remember: the employer is also responsible for the OHS of non-employees affected by his/her activities).

h) Health risks arising from neighbouring as well as own activities and from the environment, e.g. threats by dogs, bees, snakes, lightning, allergies, etc.

i) Exposure to noise.

j) Exposure to vibration.

k) Protection against dehydration and heat exhaustion.

l) Protection from wet and cold conditions.

m) Dealing with HIV/Aids and other diseases as per specific programme provided by the client or its agents.

n) Use of portable electrical equipment, including;

- Angle grinder
- Electrical drilling machine
- Skill saw

o) Excavations including;

- Ground/soil conditions
- Trenching
- Shoring
- Drainage
- Daily inspections

p) Welding including;

- Arc welding
- Gas welding
- Flame cutting
- Us of LP gas torches and appliances

q) Loading and offloading of trucks

r) Aggregate/sand and other materials delivery

s) Manual and mechanical handling

t) Lifting and lowering operations

u) Driving and operation of construction vehicles and mobile plant including;

Trench machine
Excavator
Bomag roller
Plate compactor
Front end loader
Mobile crane and the ancillary lifting tackle

Parking of vehicles and mobile plant

Towing of vehicle and mobile plant

v) Use and storage of flammable chemical substances-the client and/or its agent on its behalf to be informed of this prior to commencement of the project.

w) Temporary works and traffic accommodation.

x) Exposure to sewer plants, pipeline and excavations

y) Hygiene effects as a result of exposure to sewer

z) Environmental pollution

aa) Protection against flooding

bb) Gabion work.

cc) Protection of overhead power lines.

dd) As discovered by the principal contractor's hazards identification exercise.

ee) As discovered from any inspections and audits conducted by the client and/or its agent on its behalf or by the principal contractor or any other contactor on site.

ff) As discovered from any accident/incident investigation

10.3 Scope of Work Requirements

The following in particular requirements depending on scope of works and will form a basis for compliance audits:

A. Administrative 7 Legal Requirements

B. Education, Training & Promotion

C. Public Safety & Emergency Preparedness

D. Personal Protective Equipment

E. Housekeeping

F. Scaffolding, Formwork and Support work

G. Ladders

H. Electrical Safeguarding

I. Emergency/Fire Prevention & Protection

J. Excavation and Demolition

K. Formwork

L. Tools

M. Cranes

N. Personnel and Materials Hoists

O. Transport & Materials Handling

P. Site Plant and Machinery

Q. Plant & Storage Yard/Site Workshops Specifics

R. Health & Hygiene

10.4 OUTLINED DATA, REFERENCES AND INFORMATION ON CERTAIN AND/OR SPECIFIC OBLIGATORY REQUIREMENTS TO ENSURE COMPLIANCE

A) Administrative & Legal Requirements

Subject	OHS Act Section/Regulation	Requirements
Notice Of Construction Work	CR 4 Annexure 4	• Department of Labour notified • Copy of Notice available
Copy of the OHS Act (Act 85 of 1993)	GAR 4	• Updated Copy of the Act and Regulations
Health and Safety Specifications and Plan/Programme	CR 5 & 7(1)(a)	• H&S specifications from the Client/Agent. • OHS Plan/Programme developed and reviewed regularly.
Hazard Identification & Risk Assessment	Section 8(2)(d) CR 9	• HIRA carried out/Recorded. • Risk Assessment and OHS Plan drawn. • RA Plan available on site. • Employees/Subcontractors informed/trained.
Registration with the Compensation Commissioner/Insurer	COID Act Section 80	• Written proof of registration-Letter of good standing.
Assigned duties (Managers)	Section 16(2)	• Responsibility of complying with the OHS Act assigned to other persons by the CEO.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Designation of person responsible on site	CR 8(1)	• Competent person appointed in writing as Construction Supervisor with job description.
Designation of Assistant for above	CR 8(2)	• Competent person appointed in writing as Assistant Construction Supervisor with job description.
Designation of Health and Safety Representatives	Section 17 & 18 GAR 6	• More than 20 employees-One H&S Rep for each 50 employees or part thereof. • Designation of writing, period and area of responsibility specified in terms of GAR 6 & 7 • Meetings held monthly, minutes kept • Actioned by management
Health and Safety Committee	Section 19 & 20 GAR 5	• H&S Committee established. • All H & S Reps shall be members of the H & S Committee
Agreement with Mandatories/Contractors & Subcontractors	Section 37(1)&(2)	• Written Agreement with Contractors and Subcontractors • List of Contractors and Subcontractors displayed • Proof of registration with the Compensation Commissioner/Insurer Letter of good standing. • Construction Manager/Supervisor designated. • Written arrangements. • H&S Reps and Committee.

		• First Aider.
Reporting of incidents (Department Of Labour)	Section 24 & GAR 8 COID Act Section 38, 39 & 41	• Incident Reporting Procedure displayed. • All incidents in terms of Section 24 reported to the Provincial Director of the DoL within 3 days. (Annexure 1-WCL 1/2). • Cases of occupational diseases reported. • Copies of reports available on site. • Record of first aid injuries kept.
Investigation of incidents	GAR 9	• All injuries which resulted in the person receiving medical treatment other than first aid, recorded and investigated by investigator designated in writing. • Copies of reports available on site • Tabled at H&S meetings • Action taken by management
Fall Prevention & Protection Plan	CR 10	• Competent persons to draw up and supervise the Fall Protection Plan. • Proof of appointees' competence available on site. • Risk Assessment carried out for working at heights. • Fall Protection Plan drawn up/updated available on site
Roof Work	CR 10(5)	• Competent person appointed to draw up and supervise the Roof Work Plan.

		• Proof of appointees' competence available on site. • Risk Assessment carried out for roof work. • Roof Work Plan drawn up/updated. • Roof work inspected before each shift. Inspection Register kept. • Employees medical examined for physical & psychological fitness. Written proof on site.
Structures	CR 11	• Information regarding the structure being erected received from the Designer including: • Geo-science technical report where relevant. • Design loading of the structure. • Anticipated dangers/hazards/special measures to construct safely. • Method statements and sequence of construction. • Risk Assessment carried out. • Structures inspected before shift. Inspections register kept. • All above information available on site.
Temporary Works	CR 12	• Competent person appointed in writing to supervise erection, maintenance, use and dismantling of Support & Form Work. • Design drawings available on site.

		• Risk Assessment carried out. • Support & Formwork inspected: • Before use/inspection • Before pouring of concrete • Weekly whilst in place • Before stripping/dismantling • Inspection register kept
Scaffolding	CR 16	• Competent person appointed in writing to: • Erect scaffolding (Scaffolding Erectors) • Act as scaffolding team leaders. • Inspect scaffolding weekly and after inclement weather (Scaffold Inspectors). • Written proof of competency of above appointees' available on site. • Copy of SABS 085 available on site. • Risk Assessment carried out • Inspected weekly/after bad weather. Inspection registers kept.
Suspended Platforms	CR 17	• Competent persons appointed in writing to: • Control the erection of suspended platforms

		• Act as Suspended Platforms Team Leaders • Inspect suspended scaffolding weekly and after inclement weather • Risk Assessment conducted. • Certificate of Authorization issued by a Registered Engineer available on site/Copy forwarded to the Department of Labour • The following inspections of the whole installation carried out by a competent person: • After erection and before use • Daily prior to use. Daily inspections recorded. • The following tests to be conducted by a competent person: • Load test of whole installation and working parts every three months. • Hoisting ropes/hooks/load attaching devices quarterly. Tests logbook kept. • Employees working on Suspended Platform medically examined for physical & psychological fitness. Written proof available.
Excavation	CR 13	• Competent person/s appointed in writing to supervise and inspect excavation work. • Written proof of competence available on site. • Risk Assessment carried out.

		• Inspected: • Before every shift. • After any blasting. • After any unexpected fall of ground. • After any substantial damage to the shoring. • After rain. Inspections register kept. • Method Statement developed where explosives will be used/are used.
Demolition Work	CR 14	• Competent person/s appointed in writing to supervise and control Demolition Work. • Written proof of competence available on site. • Risk Assessment carried out. • Engineering survey and Method Statements available on site. • Inspections to prevent premature collapse carried out by a competent person before each shift. Inspections register kept.
Materials Hoist	CR 19	• Competent person appointed in writing to inspect Material Hoist. • Written proof of competence available on site. • Risk Assessment carried out. • Material hoist to be inspected weekly by a competent person. Inspections

		records kept.
Bulk Mixing Plants	CR 20	• Competent person appointed in writing to control the operation of the Batch Plant and the service, maintenance and cleaning. Register kept. • Written proof of competence available on site. • Risk Assessment carried out. • Bulk Plant to be inspected weekly and record kept.
Cranes & Lifting Machines Equipment	CR 22 DMR 18 & 19	• Competent person appointed in writing to inspect Cranes, Lifting Machines and Lifting Equipment. • Written proof of competence available on site. • Inspection: • -All cranes-**daily by the operator** • -Tower cranes-**after erection/6 monthly** • -Other cranes-**annually by competent person** • -Lifting tackle (slings/ropes/chain slings etc.)-**daily or before every new application**
Inspection & Maintenance of Electrical Installation & Equipment (Including portable electrical tools)	CR 24 Electrical Machinery 9 & 10 Electrical Installation Regulations	• Competent person appointed in writing to inspect/test the installation and equipment. • Written proof of competence available on site.

		• Electrical Installation & Equipment inspected after installation, after alterations and quarterly. Inspection register kept. • Portable electric tools, electric lights and extension leads must be uniquely identified/numbered. • Weekly visual inspection by User/Store man. Register kept.
Designation of Stacking & Storage Supervisor	CR 28 GSR 8(1)(a)	• Competent person/s with specific knowledge and experience designated to supervise all stacking and storage. • Written proof of competence available on site.
Designation of a person to coordinate emergency planning and fire protection	CR 29 ER 9	• Person/s with specific knowledge and experience designated to co-ordinate emergency contingency planning, execution and fire prevention measures. • Emergency evacuation plan developed: • Drilled/practiced • Plan & records of drills/practices available on site • Fire risk assessment carried out. • All fire extinguishing equipment identified and on register • Inspected weekly and record kept. • Serviced annually.
First Aid	GSR 3	• Every workplace shall be provided with sufficient number of firs aid boxes.

		• First aid freely available. • Equipment as per the list in the OHS Act. • One qualified First Aider appointed for every 50 employees. (Required where more than 10 persons are employed). • List of First Aid Officials and Certificates. • Name of person/s in charge of the first aid box displayed. • Location/s of first aid boxes clearly indicated. • Signs instructing employees to report all injuries/illness including first aid injuries.
Personal Protective Equipment (PPE)	GSR 2	• PPE risk assessment carried out • Items of PPE prescribed/use enforced. • Records of issue kept • Undertaking by employee to wear/use PPE • PPE remain property of the employer, not to be removed from the premises GRS 2(4).
Inspection & Use of welding/flame cutting equipment	GSR 9	• Competent person/s with specific knowledge and experience designated to inspect electrical arc, gas welding and flame cutting equipment. • Written proof of competence available on site.

		• All new vessels checked for leaks, leaking vessels NOT taken into stock but returned to supplier immediately. • Equipment identified/numbered and entered into register. • Equipment inspected weekly and record kept. • Separate, purpose made storage available for full and empty vessels.
Control of storage & usage of Hazardous Chemical Substances (HCS) and Flammables	HCS Regulations CR 25	• Competent person/s with specific knowledge and experience designated to control the storage and usage of HCS (including flammables). • Written proof of competence available on site. • Risk Assessment carries out. • Register of HCS kept on site. • MSDS available on site. • Separate, purpose made storage available for full and empty containers.
Vessels Under Pressure (VUP)	Pressure Equipment Regulations	• Competent person/s with specific knowledge and experience designated to supervise the use, storage, maintenance, statutory inspections & testing of VUP's. • Written proof of competence available on site. • Certificate of manufacture available on site. • Register of VUP on site.

		• Inspections & testing by Approved Inspection Authority (AIA): • After installation/re-erection or repairs. • Every 36 months. • Register/Logbook of inspections, tests, modifications and repairs kept.
Construction Vehicles & Earth Moving Equipment	CR 23	• Operators/Drivers appointed to: • Carry out a daily inspection prior to use • Drive the vehicle/plant that he/she is competent to operate/drive. • Written proof of competence available on site. • Record of daily inspections kept.
Inspection of ladders	GSR 13A	• Competent person/s appointed in writing to inspect ladders. • Ladders inspected at arrival on site and weekly thereafter. • Inspection records kept. • Application of the type of ladders (wooden, aluminium, etc.) regulated by training and inspections and noted in register.
Ramps	GSR 13B	• Competent person appointed in writing to supervise the erection & inspection of ramps. • Inspection register kept.

		• Daily inspected and noted in register.

B) Education and Training

Subject	Requirement
Company OHS Policy Section 7(1)	• Policy signed by the CEO and published/Circulated to the employees. • Policy Displayed on Construction/Employees Notice Board. • Management and employees committed.
Company OHS Rules Section 13(a)	• Construction site rules published and displayed. • Follow-up to ensure employees understand/adhere to the policy and rules.
Induction and Task Safety Training Section 13(a)	• All new employees receive OHS Induction Training. • Training includes Daily Safety Task Instructions (DSTI). • Employees acknowledge receipt of training. • Follow-up to ensure employees understand/adhere to instructions.
General OHS Training Section 13(a)	• All current employees receive specified OHS training: written proof • Operators of Plant & Equipment receive specified training • Follow-up to ensure employees understand/adhere to instructions.
Occupational Health and Safety Promotion	**Incident Experience Board indicating:** • Number of hours worked without injured. • Number of days worked without an injury. • Vision, Mission and Goal, Star Grading-Board kept up to date. • Safety Posters displayed & changed regularly. • Employee Notice Board for OHS Notice. • Site OHS Competition (Company OHS Competition). • Participation in projects OHS competition

C) Public Safety & Security Measures & Emergency Preparedness

Subject	Requirement
Notices & Signs	• Notices and signs at entrances/along perimeters indicating **"No Unauthorised Entry"** • Notices and signs at entrance instructing visitors and non-visitors what to do, where to go and where to report when entering the site/yard with directional signs. E.g. **"Visitors to report to Office".** • Notice and signs posted to warn of overhead work and other hazardous activities. E.g. **General Warning Signs**
Site Safeguarding (Security Measures)	• Nets, canopies, platforms, fans etc. to protect members of the public/visitors/client/employees passing/entering the site. • Access control measures/register in operation • Security patrols after hours, during weekends and holidays. • Sufficient lighting after dark • Guard has access to telephone/mobile/other means of emergency communication
Emergency Preparedness	• Emergency contact numbers displayed and made available and accessible to employees and security. • Emergency evacuation instructions posted up on all Notice Boards. • Emergency contingency plan available on site. • Emergency doors open outwards/unobstructed. • Emergency alarm audible all over the premises.
Emergency Drill & Evacuation	• Adequate number of employees trained to use firefighting equipment. • Emergency evacuation plan available displayed and practiced.

D) Personal Protective Clothing/Equipment

Subject	Requirement
PPE Needs Analysis	• Determine the needs for PPE identified and prescribed training • PPE remain the property of the employer, not to be removed from premises GSR 2(4).
Head protection	• All persons on site shall wear safety helmets including subcontractors and visitors • Visitors to wear the same.
Foot protection	• All employees on site shall wear safety footwear, including gumboots for concrete/wet work and non-slip shoes for roof work.
Eye and face protection	• **Eye and face (Also Hand and Body) Protection** (Goggles, face shields, welding helmets etc.) used when operating the following: • Jack/Kango Hammers • Angle/bench grinder • Electric drills (Overhead work into concrete/cement/bricks) • Explosive-powered tools • Concrete vibrators/pokers • Hammers and chisels • Shears • Cutting tools and equipment • Sanders and sanding machines • Cutting/welding tools • CO2 and arc welding equipment • Skill/bench saws • Spray painting equipment.
Hearing protection	• **Hearing protectors** (Muffs, plugs, etc.) used when operating the following:

	• Hammers & Chisels • Jack/Kango Hammers, etc. • Explosive power tools • Wood/Aluminium working machines e.g. saws, planers, routers. • Angle grinders • Drilling machine
Hand protection	• **Protective gloves** worn by employees when handling/using: • Cement/bricks/steel/chemicals • Welding equipment • Hammers & Chisels • Jack/Kango Hammers, etc.
Respiratory protection	• Suitable/efficient prescribed **Respirators** worn correctly by employees handling/using: • Dry cement • Dusty areas • Hazardous chemicals • Angle grinders • Spray painting etc.
Fall Protection Equipment	• Suitable safety belts/fall arrest equipment correctly used by persons working on/in unguarded, elevated positions, e.g.: o Scaffolding o Riggers o Lift shafts o Edge work o Ring beam edges etc. Other methods of fall prevention applied e.g. catch

	nets.
Protective Clothing	• All jobs requiring protective clothing (Overalls, Rain Wear, Welding Aprons, etc.) Identified and clothing worn.
PPE Issue & Control	• Identified equipment issued free of charge • All PPE maintained in good condition. (Regular checks). • Worker instructed in the proper use and maintenance of PPE. • Commitment obtained from the user accepting conditions and to wear the PPE. • Record of PPE issued kept on H&S file. • PPE remain the property of the employer, not to be removed from the premises.

E) Housekeeping

Subject	Requirement
Scrap Removal System	• All items of scrap/unusable off-cuts/rubble and redundant material removed on a regular basis. (Daily) • Scrap/waste removal from heights by chute/hoist/crane. • Nothing thrown/swept over sides. • Scrap disposed of in designated containers/areas. • Removal from site/yard on a regular basis.
Stacking and Stacking (Section 1 for Designation & Register)	• **Stacking:** • Stable, on firm level surface/base. • Prevent leaning/collapsing • Irregular shapes bonded • Not exceeding 3x the base • Stacks accessible • Removal from top only. • **Storage:**

	• Adequate storage areas • Functional-e.g. demarcated storage areas/racks/bin etc. • Special areas identified and demarcated e.g. flammable gas, cement, etc. • Neat, safe, stable and square. • Store/storage areas clear of superfluous material. • Storage behind sheds, etc., neat/under controls. • Storage areas free from weeds, litter
Waste Control/Reclamation	• Re-usable off-cuts or other re-usable material removed daily and kept to a minimum in the work areas. • All re-usable materials neatly stacked/stored in designated areas. (Nails removed/bent over in re-usable timber). • Issue of hardware/nails/screws/cartridges etc. controlled and return of unused items monitored.
Sub-Contractors	• Sub-contractors required to comply with Housekeeping requirements.

F) Working At Heights (Including Roof Work)

Subject	Requirements
Openings	• Unprotected openings adequately guarded/fenced/barricaded/catch nets installed.
	• Roof work discontinued when bad/hazardous weather. • Fall protection measures (including warning notices) when working close to edges or on fragile roofing material

G) Scaffolding

Subject	Requirement
Access/System Scaffolding	• Foundation firm/Stable. • Sufficient bracing. • Tied to structure/prevented from side or cross movement. • Platform boards in good. condition/sufficient/secured. • Handrails and toe boards provided. • Access ladders/stairs provided. • Areas under scaffolding tidy. • Safe/unsafe for use signs. • Complying with OHS Act and SANS 085
Mobile Scaffolding	• Foundation firm/stable • Sufficient bracing. • Platform boards in good condition/sufficient/secured. • Handrails and toe boards provided. • Access ladders/stairs provided. • Area/s under scaffolding tidy. • Safe/unsafe for use signs
Mobile Scaffolding	• Wheels / swivels in good condition • Brakes working and applied. • Height to base ratio correct. • Outriggers used where necessary • Complying with OH&S Act/SABS 085
Suspended Scaffolding	• Outriggers securely supported and anchored. • Correct No. of steel wire ropes used. • Platform as close as possible to the structure. • Handrails on all sides • All winches / ropes / cables / brakes inspected regularly and replaced as prescribed

	• Scaffolding complies with OHS Act (Act 85/93) • Winch(es) maintained by competent person(s)
Formwork / Support Work	• All components in good condition. • Foundation firm / stable. • Adequate bracing / stability ensured. • Good workmanship / uprights straight and plumb. • Good cantilever construction. • Safe access provided. • Areas under support work tidy. • Same standards as for system scaffolding.
Special Scaffolding	• Special Scaffolding e.g. Cantilever, Jib and Truss-out scaffolds erected to an acceptable standard and inspected by specialists.
Edges & Openings	• Edges barricaded to acceptable standards. • Manhole openings covered / barricaded. • Openings in floor / other openings covered, barricaded/fenced. • Stairs provided with handrails. • Lift shafts barricaded / fenced off.

H) Ladders

Subject	Requirement
Physical Condition / Use & Storage	• Stepladders - hinges/stays/braces/stiles in order. • Extension ladders - ropes/rungs/stiles/safety latch/hook in order. • Extension / Straight ladders secured or tied at the bottom / top. • No joined ladders used • Wooden ladders are never painted except with varnish • Aluminium ladders NOT to be used with electrical work • All ladders stored on hooks / racks and not on ground.

	• Ladders protrude 900 mm above landings / platforms / roof. • Fixed ladders higher than 5 m have cages/Fall arrest system

I) Electricity (As Part Of, Or Additional To The Manual "Safety & Switch Procedure For Electrical Installations")

Subject	Requirement
Electrical Distribution Boards & Earth Leakage	• Colour coded / numbered / symbolic sign displayed. • Area in front kept clear and unobstructed. • Fitted with inside cover plate / openings blanked off / no exposed "live" conductors / terminals/Door kept close • Switches / circuit breakers identified. • Earth leakage protection unit fitted and operating. • Tested with instrument: Test results within 15 – 30 milliamps • Aperture/Opening/s provided for the plugging in and removal of extension leads without the need to open the door • Apertures and openings used for extension leads to be protected against the elements and especially rain
Electrical Installations & Wiring	• Temporary wiring / extension leads in good condition / no bare or exposed wires. • Earthing continuity / polarity correct: • Looking at the open connectors to connect the wiring, the word "Brown" has the letter 'R' in it, so the b'**R**'own • wire connects to the '**R**'ight hand connector. "Blue" has the letter 'L' in it, so the b'**L**'ue wire connects to the • '**L**'eft hand connector. • Cables protected from mechanical damage and moisture. • Correct loading observed e.g. no heating appliance used from lighting circuit etc. • Light fittings/lamps protected from mechanical damage/moisture.

	• Cable arrestors in place and used inside plugs
Physical condition of Electrical Appliances & Tools	• Electrical Equipment and Tools: (includes all items plugging in to a 16 Amp supply socket) • Insulation / casing in good condition. • Earth wire connected/intact where not of double insulated design • Double insulation mark indicates that no earth wire is to be connected. • Cord in good condition/no bare wires/secured to machine & plug. • Plug in good condition, connected correctly and correct polarity.

J) Emergency And Fire Prevention And Protection

Subject	Requirement

Fire Extinguishing Equipment	• Fire Risks Identified and on record
	• The correct and adequate Fire Extinguishing Equipment available for:
	  ○ Offices
	  ○ General Stores
	  ○ Flammable Store
	  ○ Fuel Storage Tank/s and catchment well
	  ○ Gas Welding / Cutting operations
	  ○ Where flammable substances are being used / applied.
	  ○ Equipment Easily Accessible

Maintenance	• Fire equipment checked minimum monthly, serviced yearly
Location & Signs	• Fire Extinguishing Equipment: • Clearly visible • Unobstructed • Signs posted including "No Smoking" / "No Naked Lights" where required. (Flammable store, Gas store, Fuel tanks

	• etc.)
Storage Issue & Control of Flammables (incl. Gas cylinders	• Storage Area provided for flammables with suitable doors, ventilation, bund etc. • Flammable store neat / tidy and no Class A combustibles. Decanting of flammable substances carried out in ignition free • and adequately ventilated area. Container bonding principles applied • Only sufficient quantities issued for one task or one day's usage • Separate, special gas cylinder store/storage area. • Gas Cylinders stored / used / transported upright and secured in trolley/cradle/structure and ventilated. • Types of Gas Cylinders clearly identified as well as the storage area and stored separately. • Full cylinders stored separately from empty cylinders. • All valves, gauges, connections, threads of all vessels to be checked regularly for leaks. • Leaking acetylene vessels to be returned to the supplier **IMMEDIATELY**.
Storage, Issue & Control of Hazardous Chemical Substances (HCS)	• HCS storage principles applied: products segregated • Only approved, non-expired HCS to be used • Only the prescribed PPE shall be used as the minimum protection • Provision made for leakage/spillage containment and ventilation • Emergency showers/eye wash facilities provided • HCS under lock & key controlled by designated person • Decanted/issued in containers as prescribed with information/warning labels • Disposal of unwanted HCS by accredited disposal agent • No dumping or disposal of any HCS on or inside the storage area or anywhere else on the project site • All vessels or containers to be regularly checked for leaks

K) Excavation and trenching

L)

Subject	Requirement
Excavations	• Shored / Braced to prevent caving / falling in. • Provided with an access ladder. • Excavations guarded/barricaded/lighted after dark in public areas • Soil dumped at least 1 m away from edge of excavation • On sloping ground soil dumped on lower side of excavation • All excavations are subject to daily inspections

M) Tools

Subject	Requirement
Hand Tools	**Shovels / Spades / Picks:** * Handles free from cracks and splinters * Handles fit securely * Working end sharp and true **Hammers:** * Good quality handles, no pipe or reinforcing steel handles. * Handles free from cracks and splinters Handles fit securely **Chisels:** * No mushroomed heads / heads chamfered * Not hardened * Cutting edge sharp and square **Saws:** * Teeth sharp and set correctly * Correct saw used for the job
Explosive Powered Tools	• Only used by trained / authorised personnel. • Prescribed warning signs placed / displayed where tool is in use. • Work area must be properly isolated/demarcated during use of tool. • Inspected at least monthly by competent person and results recorded. • Issue and return recorded including cartridges / nails and unused cartridges / nails / empty shells recorded. • Cleaned daily after use.

N) Cranes

Subject	Requirement
Tower Crane	• Only operated by trained authorised operator with valid certificate of training • Structure - no visible defects • Electrical installation good/safe • Crane hook: Throat pop marked/safety latch fitted/functional • SWL/MML displayed • Limit switches with backup switches fitted/operational • Access Ladder fitted with backrests/Fall arrest system installed • Lifting tackle in good condition/inspection colour coding • Lifting tackle checked daily
Mobile Crane	• Only operated by trained authorised operator with valid certificate of training • Rear view mirrors • Windscreen visibility good • Windscreen wipers operating effectively • Indicators operational • Hooter working • Tyres safe/sufficient tread/pressure visibly sufficient • No missing Wheel nuts Headlights, taillights operational • Reverse alarm working and audible and known by all employees
Mobile Crane continued	• Grease nipples and grease on all joints • No Oil leaks • Hydraulic pipes visibly sound/no leaks • No corrosion on Battery terminals • Boom visibly in good condition/no apparent damage • Cable/sheaves greased/no visible damage/split wires/corrosion and checked daily

	• Brakes working properly • Crane hook: Throat pop marked/safety latch fitted/functional • SWL/MML displayed • By-pass valves operational • Deflection chart displayed/visible to operator/driver • Outriggers functional used
Gantry Crane	• Only operated by trained authorised persons • Correct slinging techniques used • Recognised/displayed on chart signals used • Log book kept/up to date • Prescribed inspections conducted on crane &lifting tackle and checked daily • "Crane overhead" signage, where applicable • Crane hook: Throat pop marked/safety latch fitted/functional • SWL/MML displayed/load limiting switches fitted/operational

O) Builder's Hoist

Subject	Requirement
Builder's Hoist	• "Hoist In Operation" - sign displayed. • General construction strong and free from patent defects. • Tower: * Adequately secured / braced. • At least 900 mm available for over travel. • Barricaded at least 2 100 mm high at ground level and floors. • Landing place provided with gate at least 1 800 high. • Platform: * No persons conveyed on platform • Steel wire ropes with breaking strength of six times max. load. • Signal systems used which may include two way radio connection.

	• Goods prevented from moving / falling off. • Effective brake capable of stopping and holding max. load.

P) Transport & Material Handling Equipment

Q)

Subject	Requirement
Site Vehicles	• All Site Vehicles, Dumpers, Bobcats, Loaders etc; checked daily before use by driver / operator. • Inventory of vehicles used/operated on site • Inspection by means of a checklist / results recorded. • No persons riding on equipment not designed or designated for passengers. • Site speed limit posted, enforced and not exceeded. • Drivers / Operators trained / licensed and carrying proof. • No unauthorised persons allowed to drive/operate equipment.
Conveyors	• Conveyor belt nip points and drive gear guarded. • Emergency stop/lever/brake fitted, clearly marked & accessible and tested to be functional under full load.

R) Site Plant & Machinery

Subject	Requirement
Brick Cutting Machine	• Operator Trained. • Only authorised persons use the machine. • Emergency stop switch clearly marked and accessible. • Area around the machine dry and slip/trip free/clear of off-cuts • All moving drive parts guarded/electrical supply cable protected • Operator using correct PPE - eye/face/hearing/foot/hands/body.
Electric Arc Welder	• Welder Trained. • Only authorised / trained persons use welder. • Earth cable adequately earthed to work. • Electrode holder in good condition/safe • Cables, clamps & lugs/connectors in good condition.

	• Area in which welding machine is used is dry/protected from wet. • Welder using correct PPE - eye/ face/foot/body/respirator. • Correct transparent screens & warning signs placed
Woodworking Machines	• Operators Trained. • Only authorised persons use machines. • Provided with guards. • Guards used. • Operators using correct PPE - eye/face/feet/hearing • Circular saws strictly operated according to prescribed methods and settings • Only prescribed saw blades (cross-cut, ripping blade, smooth cut, aluminium) shall be used for various applications
Compressors	• Relief valves correctly set and locked / sealed. • Maximum Safe Working Pressure (MSWP) indicated on face of pressure gauge: not on glass cover. • All drives adequately guarded. • Receiver/lines drained daily • Hoses good condition/clamped, not wired • Compressed air NEITHER used to dust off clothing/PPE/ and work areas NOR on bare skin
Concrete Mixer / Batch Plant	• Top platform provided with guardrails. • Dust abatement methods in use. • Operators using correct PPE - eye / hands / respirators. • All moving drive parts guarded. • Emergency stops identified / indicated and accessible. • Area kept clean/dry/and free from tripping and slipping hazards. • Operator's overseer identified and crane signals displayed and used.
Gas Welding / Flame Cutting	• Only authorised/trained persons use the equipment.

Equipment	• Torches and gauges in good condition. • Flashback arrestors fitted at cylinders and gauges. • Hoses in good condition/correct type/all connections with clamps • Cylinders stored, used and transported in upright position, secured in trolley / cradle / to structure. • All cylinders regularly checked for leaks, leaking cylinders returned immediately • Fire prevention/control methods applied/hot work permits

Q) Plant & Storage Yards/Site Workshops Specifics

Subject	Requirement
Section 8(2)(1) General Machinery Regulation 2(1): Supervision of the Use & Maintenance of Machinery	• Person/s with specific knowledge and experience designated in writing to Supervise the Use & • Maintenance of Machinery • Critical items of Machinery identified/numbered/placed on register/inventory • Inspection/maintenance schedules for abovementioned • Inspections/maintenance carried out to above schedules • Results recorded
General Machinery Regulation 9(2): Notices re. Operation of Machinery	• Schedule D Notice posted in Work areas
Pressure Vessels Regulation 13(1)(b): Supervision of the Use & Maintenance of Vessels under Pressure (VuP)	• Person/s with specific knowledge and experience designated in writing to Supervise the Use & Maintenance of VuP's • VuP's identified/numbered/placed on register/Manufacturers plate intact • Inspection/maintenance schedules for abovementioned • Inspections/maintenance carried out to above schedules • Results recorded/Test certificates available
Lock-out Procedure	• Lock-out procedure in operation

Ergonomics	• Ergonomics survey conducted – results on record • Survey results applied
Demarcation & Colour Coding	• Demarcation principles applied • All services, pipes, electrical installation, stop-start controls, emergency controls etc. colour coded to own • published or SABS standard • Employees trained to identify colour coding
Portable & Bench Grinders	• Area around grinder clear/trip/slip free • Bench grinders mounted securely/grinder generally in good condition/No excessive vibration • On/Off switch/button clearly demarcated/accessible • Adequate guards in place • Tool rest – secure/square/max. 2 mm gap, perpendicular to drive shaft • Stone/disk - correct type and size/mounted correctly/dressed • Use of Eye protection enforced
Battery Storage & Charging	• Adequately ventilated, ignition free room/area/no smoking signs • Batteries placed on rubber/wooden surface • Emergency shower/eye wash provided • No acid storage in area • Prescribed methods in place and adhered to when charging batteries
	• Chain Blocks/Tirfors/jacks/mobile gantries etc. identified/ • numbered on register • Chains in good condition/links no excessive wear/checked daily • Lifting hooks – throat pop marked/safety latch fitted

	• SWL/MML marked/displayed
Presses/Guillotines/ Shears	• Only operated by trained/authorised persons • Interlocks/lock-outs fitted/PPE worn or used at all times

R) Workplace Environment, Health & Hygiene

Subject	Requirement
Lighting	• Adequate lighting in places where work is being executed e.g. stairwells and basements. • Light fittings placed/installed, causing no irritating/blinding glare. • Stroboscopic effect eliminated (not only reduced) where moving objects or machinery is used
Ventilation	• Adequate ventilation/extraction/ exhausting in hazardous areas e.g. chemicals/adhesives/welding/petrol or diesel/motors running and in confined spaces/basements.
Noise	• Tasks identified where noise levels exceeds 85 dB at any one time. • All reasonable steps taken to reduce noise levels at the source. • Hearing protection used where noise levels could not be reduced to below 85 dB.
Heat Stress	• Measures in place to prevent heat exhaustion in heat stress problem areas e.g. steel decks, when the WBGT index reaches 30. (See Environmental Regulation 4) • Cold drinking water readily available at all times.
Ablutions	• Sufficient hygiene facilities provided - 1 toilet per 30 employees (National Building Regulations prescribe chemical toilets • for Construction sites) • Toilet paper available. • Sufficient showers provided. • Facilities for washing hands provided • Soap/cleaning agent available for washing hands

	• Means of drying hands available • Lock-up changing facilities / area provided. • Ablution facilities kept hygienic and clean.
Eating / Cooking Facilities	• Adequate storage facilities provided. • Weather protected eating area provided, separate from changing area • Refuse bins with lids provided. • Facilities kept clean and hygienic**.**
Pollution of Environment	• Measures in place to minimize dust generation. • Accumulation or littering of empty cement pockets, plastic wrapping / bags, packing materials etc. prevented. • Spillage / discarding of oil, chemicals and dieseline into storm water and other drains or into existing or newly dug holes/cavities on site expressly prohibited.
Hazardous Chemical Substances	• All substances identified and list available e.g. acids, flammables, poisons etc. • Material Safety Data Sheets (MSDS) indicating hazardous properties and emergency procedures in case of incident on • file and readily available. • Substances stored safely. • Expiry dates meticulously checked where applicable

11. THE PRINCIPAL CONTRACTOR'S GENERAL DUTIES

- The Principal Contractor shall at all times ensure his status of an "employer" as referred to in the Act, and will abide by his/her responsibilities, duties and functions as per the requirements of the Act and Regulations with specific reference to Section 8 of the Act.

- The Principal Contractor shall keep, and on demand make available, a copy of the Act on site at all times and in addition to that he/she will introduce and maintain a file titled "Health and Safety File", or other record in permanent form, which shall contain all relevant aspects and information as contemplated in the Construction Regulations. He/she will make this file available to the client or his representative whenever necessary or on request to an interested party.

12. THE PRINCIPAL CONTRACTOR'S SPECIFIC DUTIES

- The Principal Contractor's specific duties in terms of these specifications are detailed in the Construction Regulations 2014. The Principal Contractor shall ensure compliance to the Act and its Regulations and specifically to the above regulations, and document each record in the Health and Safety File.
- The Contractor shall ensure that no work commences on an electrical installation which requires a new supply or an increase in electricity supply before the person who supplies or contracts or agrees to supply electricity to that electrical installation has been notified of such work. The contractor shall ensure that no asbestos work is carried out before the Provincial Director of the Department of Labour has been notified in writing.

13. THE GENERAL NOTES TO THE PRINCIPAL CONTRACTOR

Legal Framework

Part of legal obligations

a) The more important Acts and relevant subordinate/secondary legislation as well as other (inter alia Local Government) legislation that also apply to the State as well as to State owned buildings and premises: -

i. The latest issue of SABS 0142: "Code of Practice for the Wiring of Premises"

ii. 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

iii. The Fire Brigade Services Act 1987, Act 99 of 1987 as amended

iv. The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended and relevant proclaimed

v. Regulations (SABS 0400)

vi. The Post Office Act 1958 (Act 44 of 1958) as amended

vii. The Electricity Act 1984, Act 41 of 1984

viii. The Regulations of Local Gas Board(s), including Publications of the SABS Standards and Codes of Practice, with specific

ix. reference to GNR 17468 dated 4th October 1997

x. Legislation pertaining to water usage and the environment

xi. Legislation governing the use of equipment, which may emit radiation (e.g. X-Rays etc.)

xii. Common Law

Legal Liabilities

a) Common Law and Legislation

b) Based on two main criteria –

- Would the reasonable person have foreseen the hazard?

  That is a reasonable person in that specific position, taking experience, qualifications, authority, position in the organization etc. into consideration
- Would the reasonable person have taken precautionary measures (action) to prevent or limit the hazard?

Negligence can be proven on failure on any or both of the above criteria (There may not necessarily be a relationship between criminal and civil liability!)

Lockout Systems - Electrical

a) A system of control shall be established in order that no unauthorized person can energize a circuit, open a valve, or activate a machine on which people are working or doing maintenance, even if equipment, plant or machinery is out of commission for any period, thus eliminating injuries and damage to people and equipment as far as is reasonably practicable.
b) Physical/mechanical lock-out systems shall be part of the safety system and included in training. Lockouts shall be tagged and the system tested before commencing with any work or repairs.

Incident Investigation

Inspection and reporting is the best way in which a responsible contractor can control his area of responsibility. All incidents therefore, irrespective of whether it gave rise to loss, injury, damage or not, shall be investigated and the results recorded in the Health and Safety File. (attached GAR 9)

14. GENERAL

The project under control of the Principal Contractor shall be subject to periodic health and safety audits that will be conducted by the client at intervals agreed upon between the Principal Contractor and the client, provided such intervals will not exceed periods of one month.

The Principal Contractor is to ensure that he/she and all persons under his control on the construction site shall adhere to the above specifications, as non-conformance will lead to the client taking action as directed by Construction Regulation 5(1)(q).

The Principal Contractor should note that he/she shall be held liable for any anomalies including costs and resulting deficiencies due to delays caused by non-conformance and/or non-compliance to the above Health and Safety Specifications and the Health and Safety Plan based on these specifications.

14.1 Emergency Procedures

The contractor shall submit for acceptance of the **Vaal Central Water's Assistant Manager: SHEQ/Construction SHE Officer** an Emergency Procedure which include but are not limited to the fire, spills, accidents to employees, exposure to hazardous substances, which:

- Identifies the key personnel who are to be notified of any emergency
    - Sets out details including contact numbers of available emergency services; and
    - The actions or steps which are to be taken during an emergency.

The Contractor shall within 24 hours of an emergency taking place notify **Vaal Central Water's Assistant Manager SHEQ/ SHEQ Officer** in writing of the emergency and briefly outline what happened and how it was dealt with.

14.2 Health and Safety File

Contents of the OHS plan.

The OHS plan shall include but not limited to the following:

• **Principal contractor OHS Policy**

• Legal and other requirements: Principal contractor must specify what legal and other requirements will be applicable to the construction process:

• **Hazard Identification and Risk Assessment:** The principal contractor must in detail demonstrate how, when, where and what type of risk assessments and by whom risk assessments will be conducted?

• **Objectives and targets**: Objectives and targets must be set and detailed description to be given how objectives and targets will be reached.

• **Resources, Roles, and Responsibilities:** Appointments, who will be appointed for what.

• **Competency training and awareness**: Detailed description of what training will take place, including induction, job specific training and external training.

• **Communication:** Types of communication that will take place. Meetings and frequency of meetings (OHS committee meetings/site meetings. Monthly reports.

• **Performance monitoring:** What types of monitoring would be done: Inspections/ PTO's etc.

• **Inspections:** Inspections, frequency of inspections the people responsible for inspections.

• **Incident Management and Investigation:** Who, when, why, where, and how incidents will be managed.

• **Audits:** Types of audits and frequency of audits

• **Signage:** Signage that will be used

• Access control / Security

• Public Health and Safety

• Traffic Management and accommodation

• PPE Management

• First Aid arrangements

• Emergencies

• Management of subcontractors.

• Control of Documents

• Occupational Health and Safety budget

• **Operational control:** This refers to the material, equipment and activities that will take place on site based on the scope of work and will be as follows:

✓ Signage

✓ Equipment transport to site. Delivery and offloading.

✓ Construction employee facilities

✓ Stacking and Storage

✓ Housekeeping

✓ Waste management

✓ Construction vehicles and mobile plant

✓ Hand tools

✓ Temporary electrical installations

✓ Electrical work

✓ Use of portable electrical tools

✓ Ladders

✓ Clearing and grubbing. Vegetation clearance

✓ Excavations

✓ Bedding and Backfilling

✓ Lifting machines and lifting equipment

✓ Lifting operations

✓ Welding and flame cutting activities.

✓ Grinding / Using circular saws.

✓ Tie into existing services

✓ Confined spaces

✓ Electrical and mechanical works.

✓ Adverse weather conditions

✓ Use and storage of flammable liquids.

✓ Hazardous chemical substances

✓ Dangerous animals.

✓ Working close to water environments

✓ Lighting

✓ Ventilation

✓ Noise

✓ Working in or with sewage / effluent

✓ Removing asbestos material.

The OH&S file/files opened in terms of Construction Regulation 5(1)(s) and CR 7(1)(b) shall always be kept on site. This shall be a file or permanent record containing information on aspects of the contract regarding OHS of any person who may be affected by the construction work.

The principal contractor shall appoint a suitably qualified person to prepare the file/files and to keep it up to date for the duration of the contract. The file shall include the following information but not limited to:

- Appointment – Principal contractor
- 37(2) Mandatory agreements between client and principal contractor
- Appointment – OHS Agent
- Client OHS specifications.
- Client Baseline Risk assessment
- Principal contractor OHS plan and approval.
- Construction Work Permit
- Letter of Good Standing
- Public liability insurance
- Copy of the Occupational Health and Safety Act
- Copy of Construction Regulations
- Copy of the COID Act
- Legal Register
- OHS Policy
- Organogram & Appointments & Competencies of appointed persons
- Employee management: Personal profiles / ID's / Medicals with annexure 3 attached.
- Risk Management: Risk assessment review register / method statements / risk assessments / safe operating procedures / planned task observations / daily safety task instructions.
- Training and communication. (Induction / toolbox talks)

- Minutes of meetings
- Monthly reports
- Inspections
- Incident management: Incident registers / Incident investigations forms & templates
- Emergency Management
- PPE management
- Management of Contractors
- Fall protection.
- HCS
- Construction vehicles and mobile plant
- Lifting machines
- Traffic management
- Waste management
- COC's (Certificate of Compliance)
- Confined spaces
- Excavation inspections

The Contractor shall maintain on site a health and safety file which contains copies of the following, as relevant:

Documents required prior to commencing with physical construction activities

a) The Contractor's health and safety policy signed by the Chief Executive Officer, which outlines the Contractor's objectives concerning the protection of the health and safety of his employees at work, and how they will be achieved and implemented by the Contractor;
b) The notification made to the Provincial Director of Labour, and if relevant, the notification of the person who supplies or contracts or agrees to supply electricity to the electrical installation;
c) The letters of appointment, as relevant, of the construction supervisor for the site in respect of construction works covered by the Construction Regulations and the registered person responsible for the electrical installation covered by the Electrical Installations Regulations;
d) A copy of the certificate of registration of the registered person responsible for the electrical installation covered by the Electrical Installations Regulations;
e) The approval of the design of the part of an electrical installation which has a voltage in excess of 1 kV by a person deemed competent in terms of the Electrical Installations Regulations;
f) The preliminary hazard identification undertaken by the competent person;
g) Proof of registration of the electrical contractor who undertakes the electrical installation

in terms of the Electrical Installations Regulations;

h) The organogram which outlines the roles and responsibilities of the construction supervisor's assistants and safety officers; and
i) The contractor's health and safety plan;
j) The emergency procedure;
k) The procedure for the replacement of lost, stolen, worn or damaged personal protective clothing; and
l) Proof that the contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer;

Any revisions to the organogram which outlines the roles and responsibilities of the construction supervisor's assistants and safety officers;

a) Each and every subcontract agreement;
b) Proof that every subcontractor is registered and in good standing with compensation fund or with a licensed compensation insurer;
c) Proof of all subcontractor's induction training whenever it is conducted;
d) Copies of the minutes of the subcontractors health and safety meetings;
e) Copies each of the Contractor's subcontractors' health and safety policy, signed by the Chief Executive Officer, which outlines the Contractor's objectives and how they will be achieved and implemented by the Contractor;
f) The health and safety plans of all the Contractor's subcontractors who are required to provide such plans;
g) A comprehensive and updated list of all subcontractors employed on site by the contractor, indicating the type of work being performed by such subcontractors;
h) The outcomes of the monthly audits for compliance with the approved health and safety plan of each and every subcontractor working on the site;
i) Any report made to an inspector by the health and safety committee;
j) The minutes of all health and safety meetings and every recommendation made to the Contractor by the health and safety committee.

14.3 Identification Of Hazards And Development Of Risk Assessments, Standard Working Procedures (SWP) And Method Statements

The Principal Contractor is required to develop Risk Assessments, Standard Working Procedures (SWP) and Method Statements for each activity executed in the contract or project. The identification of hazards is over and above the hazards identification programme and those hazards identified during the drafting of the Health and Safety Plan. The Contractor shall before the commencement

of any work on the site and during construction work, cause a risk assessment to be performed by a competent person appointed in writing. Such an assessment shall as a minimum:

i. Identify the risks and hazards to which persons may be exposed to;
ii. Analyse and evaluate the identified risks and hazards;
iii. Document a plan of safe work procedures, including the use of any personal protective equipment or clothing and the undertaking of periodic toolbox talks or inductions before undertaking hazardous work, to mitigate, reduce or control the risks and hazards that have been identified;
iv. Provide a monitoring plan

Note: A risk assessment is a crucial step in protecting workers as well as complying with the law. It helps to focus on the risks that really matter in a particular workplace – the ones with the potential to cause harm. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures. The following four steps are recommended:

a) **Identify the Hazards:** By looking at what could reasonably be expected to cause harm, ask employees or their representatives what they think, obtain advice from trade associations or publications on health and safety, check manufacturer's instructions or data sheets for chemicals and equipment as they can be very helpful in spelling out the hazards and putting them in their true perspective, review accident and ill health records, think about long term hazards to health (e.g. high levels of noise or exposure to harmful substances) as well as safety hazards etc.

b) **Identify who May be Harmed and how** by identifying how groups of people might be harmed i.e. what type of injury or ill health might occur?

c) **Evaluate the Risks and Decide on Precautions** by doing everything reasonably practicable to protect people from harm i.e. by looking at how things are done, what controls are in place and how the work is organised and comparing this against good practice to see if more can be done to bring practices up to standard. Consider if the hazard can be got rid of all together, and if not, how can the risk be controlled so that harm is unlikely e.g. try a less risky option (e.g. switch to using a less hazardous chemical); prevent access to the hazard (e.g. by guarding); organize work to reduce exposure to the hazard (e.g. put barriers between pedestrians and traffic); issue personal protective equipment (e.g. clothing, footwear, goggles etc.); and provide welfare facilities (e.g. first aid and washing facilities for removal of contamination)

d) **Record the Findings** by writing down the findings of the risk assessment

e) The Contractor shall ensure that as far as is reasonably practicable, ergonomic related hazards are analysed, evaluated and addressed in the risk assessment.

14.4 Arrangements For Monitoring And Review

Monthly Audit by Client and/or its Agent on its behalf. The Client and/or its Agent on its behalf will be conducting Periodic Audits at times agreed with the Principal Contractor Audit to comply with Construction Regulation 5(1)(o) to ensure that the principal Contractor has implemented, is adhering to and is maintaining the agreed and approved OH&S Plan.

Other audits and inspections by client and/or its agent on its behalf

The Client and/or its Agent on its behalf reserves the right to conduct any other ad hoc audits and inspections as it and/or its Agent on its behalf deem necessary.

A representative of the Principal Contractor and the relevant Health and Safety Representative(s) (SHE-Reps) must accompany the Client and/or its Agent on its behalf on all Audits and Inspections and may conduct their own audit/inspection at the same time. Each party will, however, take responsibility for the results of his/her own audit/inspection results. The Client and/or its Agent on its behalf may require to be handed a copy of the minutes of the previous Health and Safety Committee meeting reflecting possible recommendations made by that committee to the Employer for reference purposes.

The findings of all audit reports made regarding the implementation of the Contractor's or subcontractor's health and safety plan;
The inputs of the health and safety officer, if any, into the health and safety plan;
Details of induction training conducted whenever it is conducted including the list of attendees;

14.5 Reports

The Principal Contractor shall report all incidents where an employee is injured on duty to the extent that he/she:

- dies
- becomes unconscious
- loses a limb or part of a limb
- is injured or becomes ill to such a degree that he/she is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he/she was usually employed

OR where:

- a major incident occurred
- the health or safety of any person was endangered
- where a dangerous substance was spilled

- the uncontrolled release of any substance under pressure took place
- machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- machinery ran out of control,

to the Provincial Director of the Department of Labour within seven days and at the same time to the Client and/or its Agent on its behalf.

Refer in this regard to Section 24 of the Act & General Administrative Regulation 8.

The Principal Contractor is required to provide the Client and/or its Agent on its behalf with copies of all statutory reports required in terms of the Act and the Regulations.

The Principal Contractor is required to provide the Client and/or its Agent on its behalf with a monthly "SHE Risk Management Report".

The Principal Contractor is required to provide a.s.a.p. the Client and/or its Agent on its behalf with copies of all internal and external accident/incident investigation reports including the reports contemplated in 12.7, 12.8.2, 15, 16, 17, 21 and 22 below. As soon as the occurrence of any accident/incident of whatever nature comes to the notice of the Principal Contractor, it shall be reported immediately.

14.6 Review

The Principal Contractor is to review the Hazard Identification, Risk Assessments and Standard Work Processes at each Production Planning and Progress Report meeting as the construction work develops and progresses and each time changes are made to the designs, plans and construction methods and processes.

The Principal Contractor must provide the Client and/or its Agent on its behalf, other Contractors and all other concerned parties with copies of any changes, alterations or amendments as contemplated in the above paragraph.

14.7 Site Rules and other Restrictions

Site OH&S Rules

The Principal Contractor must develop a set of site-specific OH&S rules that will be applied to regulate the Health and Safety Plan and associated aspects of the construction.

When required for a site by law, visitors and non-employees upon entering the site shall be issued with the proper Personal Protective Equipment (PPE) as and when necessary.

14.8 Security Arrangements

The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period. Access control must include the rule that non-employees shall at all times be provided with fulltime supervision while on site.

The Principal Contractor must develop a set of Security rules and procedures and maintain these throughout the construction period.

If not already tasked to the H&S Officer appointed in terms of Construction Regulation 8(8), the Principal Contractor must appoint a competent Emergency Controller who must develop contingency plans for any emergency that may arise on site as indicated by the risk assessments. These must include a monthly practice/testing programme for the plans e.g. January: trench collapse, February: flooding etc. and practiced/tested with all persons on site at the time, participating.

14.9 Training

The contents and syllabi of all training required by the Act and Regulations including any other related or relevant training as required must be included in the Principal Contractor's Health and Safety Plan and Health and Safety File.

14.10 General Induction Training

All employees of the principal and other Contractors must be in possession of proof of General Induction training

14.11 Site Specific Induction Training

All employees of the principal and other Contractors must be in possession of Site Specific Occupational Health and Safety Induction or other qualifying training

14.12 Other Training

All operators, drivers and users of construction vehicles, mobile plant and other equipment must be in possession of valid proof of training. All employees in jobs requiring training in terms of the Act and Regulations must be in possession of valid proof of training as follows:

Occupational Health and Safety Training Requirements: (as required by the Construction Regulations and as indicated by the Health and Safety Specification Document & the Risk Assessment/s and recommendations by the Health and Safety Committee):

- General Induction (Section 8 of the Act)
- Site/Job Specific Induction (also visitors) (Sections 8 & 9 of the Act)

- Site/Project Manager
- Construction Supervisor
- OH&S Representatives (Section 18 (3) of the Act)
- Training of the Appointees indicated in 12.6.1 & 12.6.2 above
- Operation of Cranes (Driven Machinery Regulations 18 (11)
- Operators & Drivers of Construction Vehicles & Mobile Plant (Construction Regulation 23)
- Basic Fire Prevention & Protection (Environmental Regulations 9 and Construction Regulation 29)
- As a minimum basic First Aid to be upgraded when necessary (General Safety Regulations 3)
- Storekeeping Methods & Safe Stacking (Construction Regulation 28)
- Emergency, Security and Fire Co-ordinator

The health and safety file shall be made available for inspection by any inspector, subcontractor, the Project Manager, **Vaal Central Water's Assistant Manager SHEQ/Construction Safety Officer** or employee of the contractor upon the request of such persons. The Contractor shall hand over the health and safety file to Vaal Central Water's Assistant Manager SHEQ/ Construction Safety Officer upon completion of the contract and if relevant, a certificate of compliance accompanied by a test report for the electrical installation in accordance with the provisions of the Electrical Installations Regulations.

14.13 Health and Safety Committee

The Contractor shall convene health and safety meetings whenever more than two (2) health and safety representatives have been appointed for the site. These meetings shall be attended by all health and safety representatives and persons nominated by the Contractor. Such meetings shall be convened at least once every month to:

a) Make recommendations to the Contractor regarding any matter affecting the health or safety of persons on the site; and
b) Discuss any incident on the site in which or in consequence of which any person was injured, became ill or died.

The Contractor shall consult with the health and safety committee on the development, monitoring and review of the risk assessment. The Contractor shall ensure that minutes of the health and safety committee are kept.

14.14 Inspectors, Formal Enquiries and Incidents

The Contractor shall inform the relevant safety representative:

a) Beforehand of inspections, investigations or formal inquiries of which he/she has been notified by an inspector; and

b) As soon as reasonably practicable of the occurrence of an incident on the site.

The Contractor shall record all incidents and notify **Vaal Central Water's Assistant Manager SHEQ/ Construction Safety Officer** of any incident, except in the case of a traffic accident on a public road, as soon as possible after it has occurred and report such incidents to an inspector. The Contractor shall investigate all incidents and issue **Vaal Central Water's Assistant Manager SHEQ/ Construction Safety Officer** with copies of such investigations.

14.15 Health and Safety Representatives

The Contractor shall appoint in writing one health and safety representative for every 50 employees working on the site, whenever there are more than 20 employees on the site, to:

a) Review the effectiveness of health and safety measures;
b) Identify potential hazards and potential major incidents;
c) In collaboration with Vaal Central Water, examine the causes of incidents;
d) Investigate complaints by any employee of the Contractor relating to that employee's health and safety on the site;
e) Make recommendations to the Contractor on matters arising from a), b), c) or d) on general matters affecting the health or safety of employees at the workplace;
f) Inspect the site with a view to, the health and safety of employees, at regular intervals;
g) Participate in consultations with inspectors at the workplace and accompany inspectors on inspections at the workplace; and
h) Participate in any internal health and safety audit

The Contractor shall provide the health and safety representative with the necessary assistance, facilities and training to carry out the functions.

14.16 Construction Supervisor

The Contractor shall, prior to commencing the work, appoint a full time competent employee in writing as the Construction Supervisor for the site, with the duty of supervising the performance of the work falling within the scope of the contract and may appoint one or more competent employees to assist the appointed construction supervisor.

The Contractor may, having considered the size of the project, the degree of dangers likely to be encountered or the accumulation of hazards or risks on the site appoint a full time or part time construction safety officer in writing, who has in the Contractor's opinion the necessary competencies and resources, to assist the Contractor in the control of all safety related aspects on the site.

14.17 Occupational Health and Safety Staff

The Contractor shall appoint in writing a full-time Occupational Health and Safety Manager for the project. The Occupational Health and Safety Manager shall have the necessary competence and

resources to perform his duties diligently and shall be professionally registered with the SACPCMP as a Pr CHSM. The contractor shall furthermore ensure that one Occupational Health and Safety Officer is employed for every 100 employees, and shall be equipped with the following:

- Computer
- Camera
- Access to telephone
- Printing/ scanning/ copying facilities

The Contractor shall compile and maintain an organogram which outlines the roles and responsibilities of the construction supervisor's assistants and safety officers.

The appointed safety manager/officer must comply with the following competencies;

- **NADSAM / SAMTRAC / NEBOSH / Equivalent**
- **Registered as Construction health and safety manager/officer at SACPCMP.**
- **Hazard Identification and risk assessment (HIRA)**
- **Legal Liability**
- **Excavation inspection course (Safety officer will not be allowed be appointed as excavation supervisors/inspectors. The course will assist them to identify hazards better regarding excavation works.)**
- **Confined space training**

No health and safety officer or health and safety manager will be allowed on site if not registered with the SACPCMP. Conformation letters shall not be accepted.

14.18 Vaal Central Water's Assistant Manager: SHEQ/Construction Safety Officer

Vaal Central Water's Assistant Manager: SHEQ/Construction Safety Officer shall:

- Audit the Contractor's compliance with the requirements of this specification prior to the commencement of any physical construction activities on the site;
- Accept or reject all safety plans, giving reasons for rejecting such plans;
- Monitor the effective implementation of all safety plans;
- Conduct periodic and random audits on the health and safety file to establish compliance with the requirements of this specification;
- Visit the site at regular intervals to conduct site inspections, and based upon such visits issue, wherever necessary, Improvement Notices, Contravention Notices and Prohibition Notices to the Contractor or any of the Contractor's subcontractors with a copy to the Project Manager and,

where relevant, to the Contractor.

The Contractor shall invite **Vaal Central Water's Assistant Manager: SHEQ/Construction Safety Officer shall:** audit compliance with the requirements of this specification before commencing with any physical construction activity on the site.

Documents required after construction activities have commenced

The letters of appointments, if relevant, of

a) Persons who are required to assist the construction supervisor;
b) Safety Officers
c) Health and Safety Representatives;
d) Replacement of construction supervisor; and
e) Assistants of construction supervisor

The Contractor shall with respect to the site and construction works that are contemplated:

i. Cause a preliminary hazard identification to be performed by a competent person before commencing any physical construction activity;
ii. Evaluate the risks associated with such work constituting a hazard to the health and safety of such employees and steps that need to be taken to comply with the Act; and
iii. As far as is reasonably practicable, prevent the exposure of such employees to hazards concerned or; where prevention is not reasonably practicable, minimize such exposures;

Note: the information provided by the designer shall outline known or anticipated dangers or hazards relating to the works and make available all information required for the safe execution of the work. It shall provide as relevant, geotechnical information (or refer to reports provided in the site information), the loading of the structure is designed to withstand, the methods and sequence of construction.

The Contractor shall carry out regular inspections and audits to ensure that the works are being performed in accordance with the requirements of this specification.

14.19 Health and Safety Plans

The Contractor shall prior to commencing the works to which specification applies, submit to **Vaal Central Water's Assistant Manager SHEQ/ SHEQ Officer** for approval a suitable and sufficiently documented health and safety plan, based on this specification and the risk assessment that is conducted. The health and safety plan shall as a minimum provide:

- The information contained in Table 1 in respect of each of the hazards associated with work falling within the scope of the contract.

Table 1: Example of the Format of a Health and Safety Plan

What are the hazards relating to work tasks?	Who might be harmed and how?	What are the safe work procedures for the site?	What further action is necessary (monitoring and review)?	Action by Whom	Action by When

An outline of the manner in which the Contractor intends complying with the requirements of this specification:

a. The Contractor shall discuss the submitted health and safety with **Vaal Central Water's Assistant Manager SHEQ/ SHEQ Officer**, modify such plan in the light of the discussions and resubmit the modified plan for approval.
b. The Contractor shall apply the approved health and safety plan from the date of its commencement and for the duration of the works to which this specification applies.
c. The Contractor shall conduct periodic audits for compliance with the approved health and safety plan at intervals agreed upon with **Vaal Central Water's Assistant Manager SHEQ/ SHEQ Officer**, but at least once every month.
d. The Contractor shall update the health and safety plan whenever changes to the works are brought about.

Responsibilities towards employees and visitors

The Contractor shall as far as is reasonably practicable, cause every employee to be made conversant with the hazards to his health and safety attached to any work which he has to perform, any article or substance which he/she has to produce, process, use, handle, store or transport and any plant or machinery which is required or permitted to use, as well as with the precautionary measures which should be taken and observed with respect to those hazards or safe work procedures.

The Contractor shall ensure that all employees under his or her control are:

- Informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment; and
- Issued with proof of health and safety induction training issued by a competent and carry proof

of such induction when working on site.

The Contractor shall cause a record of training to be kept which indicates the names, identity numbers and job description of all those who attended such training.

The Contractor shall not allow or permit any employee to enter the site, unless such person has undergone health and safety induction training pertaining to the hazards prevalent on the site at the time of entry.

The Contractor shall ensure that each visitor to a construction site, save where such visitor only visits the site office and is not in direct contact with the construction work activities. Undergoes health and safety instruction pertaining to the hazards prevalent on the site; and Is provided with necessary personal protective equipment.

The Contractor shall provide suitable on-site signage to alert workers and visitors to health and safety requirements. Such signage shall include but not be limited to:

- Unauthorized entrance prohibited;
- Signage to indicate what personal protective equipment is to be worn; and
- Activity related signs.

The Contractor shall not permit any person who is or who appears to be under the influence of intoxicating liquor or drugs, to enter or remain at workplace.

Subcontractors

The Contractor may only subcontract work in terms of a written subcontract and shall only appoint a subcontractor should he/she be reasonably satisfied that such a subcontractor has the necessary competencies and resources to safely perform the work falling within the scope of the contract.

Such a subcontractor shall require that the subcontractor to:

- Co-operate with the Contractor as far as is necessary to enable both the Contractor and subcontractor to comply with the provisions of the Act; and
- As far as is reasonably practicable, promptly provide the Contractor with any information which might affect the health and safety of any person at work or which might justify a review of the health and safety plan.

The Contractor shall provide any subcontractor who is submitting a tender or appointed to perform a subcontract falling within the scope of the contract, with the relevant sections of this specification and any work specific information which might be pertinent to the subcontract.

The Contractor shall take reasonable steps as are necessary to ensure:

- Co-operation between all subcontractors to enable each of those subcontractors to comply with the requirements of the Act and associated regulations; and
- That each subcontractor's health and safety plan is implemented.

- The Contractor shall conduct periodic audits for complaints with the approved health and safety plan of each subcontractor working on the site at intervals agreed upon with subcontractors, but at least once per month.
- The Contractor shall stop any subcontractor from executing construction work which is not in accordance with the Contractor' s or subcontractor's health and safety plan for the site or which poses a threat to the health and safety of person.
- The Contractor shall ensure that where changes to the works occur, sufficient health and safety information and appropriate resources are made available to the subcontractor to execute the work safely.

The Contractor shall ensure that:

- Every subcontractor is registered and in good with the compensation fund or with a licensed compensation insurer prior to work commencing on site;
- Potential subcontractors submitting tenders have made provision for the cost of health and safety measures during the construction process; and
- Every subcontractor has in place a documented health and safety plan prior to commencing any work on site which falls within the scope of the contract.
- The Contractor shall receive, discuss and approve health and safety plans submitted by the subcontractor.
- The Contractor shall ensure that all subcontractors are informed regarding any hazard as stipulated in the risk assessment before any work commences, and thereafter at such times as may be determined in the risk assessment.
- The Contractor shall reasonably satisfy him/herself that all employees of subcontractors are informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment.
- The Contractor shall satisfy himself that all subcontractor employees deployed in the site are:
  - Informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment; and
  - Issued with proof of health and safety induction training issued by a competent person and carry proof such induction when working on site.

First Aid, Emergency Equipment and Procedure

The Contractor shall where more than five employees are employed at a workplace provide a first aid box or boxes at or near the workplace which shall be available and accessible for the treatment of injured persons at that workplace. Such first aid boxes shall contain suitable first aid equipment.

The Contractor shall ensure that where are more than 10 employees employed on the site that for every group of up to 50 employees at that workplace, at least one person is readily available during normal working hours, who is in possession of a valid certificate of competency in first aid.

Facilities for Workers

The Contractor shall provide and keep clean and fit for use at or within reasonable access on the site:

a) At least one shower facility for every 15 workers;
b) At least one sanitary facility for every 30 workers;
c) Changing facilities for each sex; and
d) Sheltered eating areas.

A Contractor shall provide reasonable and suitable living accommodation for the workers at construction sites which are remote from their homes and where adequate transportation between the site and homes, or other suitable living accommodation if not available.

Annexure 1

CONSTRUCTION REGULATIONS AUDIT CHECKLIST

Y=Yes **N**=No **N/A**=Not Applicable

VCW SHEQ Officer		
Name of Company		Principal Contractor Sub-Contractor:
Project Name		
Project Amount		
Duration		
Manager		
Cell #		
Email		
Date		

1.	Act	Principal Contractor & Sub-Contractor	Y	N	N/A	Remarks
		Contractor's Organogram				
	Sec 7	Contractor's OHS Policy				
	CR 3	Application for construction work permit				
	CR 4	Notification of construction work to DOL				
	CR 5 1(g)	Sufficient OHS budget in the BOQ (Budget Breakdown)				
	CR 5(1)(j)	Letter of Good Standing (Workman's Compensation)				
	*	Certificate Number				
		Registration Number				
		Expiry Date				
		Public Liability insurance				
		Insured Amount				
		Expiry Date				

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

	CR 5(a)	Baseline Risk Assessment				
	CR 5(b)	Health and Safety Specification				
	CR 6	Designer's Report				
	CR 7	Health and Safety Plan				
	Sec 37(1& 2)	Mandatory Agreement				
2.	Act	Appointments (Competent Person)	Y	N	N/A	Remarks
	Sec 16(2)	Designated Employer				
		Competency				
		Institution				
		Competency				
		Institution				
		Professional Registration				
	Sec 17(1)	SHE REP (More than 20 employees)				
		Competency				
		Institution				
	Sec 19(1)	Chairperson (SHE Committee)				
	GAR 8/9 Sec 24	Competent Person to do Investigations kept on SHE file				
	GMR 2(1)	Competent Person (Machinery)				
	CR 8(1)	Construction Manager				
		Competency				
		Institution				
		Competency				
		Institution				
		Professional Registration				
	CR 8(7)	Construction Supervisor				
		Competency				

		Institution				
		Professional Registration				
	CR 8(8)	Assistant Construction Supervisor				
		Competency				
		Institution				
	GSR 3(4)	First Aider				
		Competency				
		Institution				
	CR 8(5)	Construction Safety Officer				
		Competency				
		Institution				
		Professional Registration (SACPCMP)				
	*	Full Time				
	*	Part Time				
	*	If part time what is the frequency of visits to site				
	CR 9(1)	Competent Person to do Risk Assessment				
	*	Monitoring Plan				
	*	Review Plan				
	CR 10(1)(a)	Competent Person (Fall Protection Plan)				
		Competency				
		Institution				
	CR 10(a)	Competent Person (Form Work & Support Work)				
		Competency				
		Institution				
	CR 13(1&2)	Competent Person (Excavation Work)				
		Competency				

		Institution				
	CR 14(1)	Competent Person (Demolition Work)				
		Competency				
		Institution				
	CR 16(1)	Competent Person (Scaffolding)				
		Competency				
		Institution				
	CR 19	Competent Person (Material Hoist Operator)				
	CR 19(8)(a)	Competent Person (Material Hoist Inspector)				
		Competency				
		Institution				
	CR 18(1)	Competent Person (Batch Plant Operation)				
		Competency				
		Institution				
	CR 19(2)(b)	Competent Person (Inspection of explosive powered tools)				
	CR 19(2)(g)	Competent Person (Issuing & collection of cartridges & nails)				
		Competency				
		Institution				
	CR 22(e)	Competent Person (Crane and Certified)				
		Competency				
		Institution				
	CR 23(1)(j)	Construction Vehicle & Mobile Plants Inspector				
	CR 24 (c & d)	Temporary Electrical Installation Inspector				
		Competency				
		Institution				
	CR 28(a)	Competent Person (Stacking and Storage)				

		Competency				
		Institution				
	CR 29 (h)	Competent Person (Fire Equipment Inspector)				
		Competency				
		Institution				
3.	Act CR 9(1)	Risk Assessment shall include:	Y	N	N/A	Remarks
	CR 9(1)(a)	Risk Identification				
	CR 9(1)(b)	Risk Analysis				
	CR 9(1)(c)	Risk Controls				
		Matrix and Rating				
	CR 9(1)(d)	Monitoring Plan				
	CR 9(1)(e)	Review Plan				
		Training Attendance Register				
4.	Act CR 7(7)	Induction Training	Y	N	N/A	Remarks
	CR 7(4)	Company Training Syllabus				
	CR 7(9)(a)	Training Attendance Register				
	CR 7(9)(b)	Proof of Induction on Person				
	*	Was induction done by Client				
	*	Was Induction done Company				
5.	Act CR 8(1)(a)	Fall Protection Plan				
	CR 8(2)(A)	A Risk Assessment				
		Where people are working on elevated position				
	CR (2)(c)	Training Program				
		Training Attendance Register				
	CR 8(2)(d)	Planned Inspections (Fall Protection Equipment)				
	CR 8(3)	Is the Supervisor in possession of Fall Protection Plan)				

6.		Certificate of Medical Fitness				
		Evaluation of physical fitness of persons by a registered Medical Practitioner (ORIGINALS)				
7.	Various	Planned Maintenance Inspection. Registered Records (Checklists and Signature)				
	Sec 44	Scaffolds				
	CR 8(2)(d)	Inspection, testing and maintenance of fall protection equipment (Checklists and signature)				
	DMR 18(5)	Lifting machines and lifting tackle				
	GSR 3(3) GSR 3(4)	First aid box Valid Certificate in First Aid				
	EMR 9	Portable Electric Equipment				
	EMR 10	Portable Electric Lights				
	GSR 2	Personal Protective Equipment				
	*	PPE/Risk Analysis				
	*	Do you have Checklists				
	*	Are all equipment permanently and clearly numbered				
8.		Records to be kept				
	CR 4(1)	Notification to the Regional Director				
	CR 5(6)	Copy of every contractor available on site.				
	CR 5(7)	Contractor's SHE File including all required documentation available on site				
	CR 5(8)	Consolidated SHE File to be handed to Bloem Water after completion of work.				
	CR 5(9)	Comprehensive and updated list of all contractors, agreements, the work being done included in SHE File available onsite.				
	CR 7(2)	Risk Assessments Available onsite				
		Risk Assessments addressing all the hazards on site, dated and signed by the Risk Assessor.				

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

		All hazards identified communicated to the employees. (Provide proof).				
	CR 7(9)	Proof of induction training available on site.				
	CR 8(3)	Construction Supervisor has latest available version of Fall Protection Plan.				
	CR 9(2)(b)	Designer's information in writing to contractor of dangers and hazards relating to construction work.				
	CR 11(1)(c)	Drawings pertaining to the design of/support work structure kept on site and available.				
	CR 11(3)(h)	Record of excavation inspections on site and available				
	CR 12(2)	Method statement for demolition a structure				
	CR 12(11)	Method statement for demolishing a structure				
	CR 15(2)(b)	Certificates of system design for suspended platform				
	CR 15(2)(c)	Operational Compliance Plan				
	CR 15(10)	Competence of Erectors, Operators and Inspectors				
	Permit System	Daily Inspection Record				
	CR 15(11)	Suspended platform design drawings, inspections and performance test records on site and available				
	CR 15(12)(c)	Training Records Signature				
	CR 17(8)(c)	Materials Hoist Inspection records on site and available				
	CR 18(9)	Maintenance and Repair Records on site and available				
	CR 19(2)(9)	Register of nails and studs (explosive powered tool)				
	CR 21(1)(j)	Construction Vehicle and mobile plant inspection register				
	CR 22(d)	Temporary Electrical Installation Inspection Register				
	Permit System	Workers Register Daily				
	HCS.REGS	Chemical substances and Data Sheets				
		Toolbox Talks Daily				

	GSR 2	Issuing of PPE and Facilities (Proof and Signed)				
		Treatment Register (First Aid Box)				
	GAR 9	Reportable Incidents				
	File	Accident and Incident reports (firs aid-medical cases-lost time cases)				

REMARKS:

Construction Safety Officer		Contractor	

Manager SHEQ		Approved	Yes	No

Date	

Annexure 2

APPLICATION FOR A PERMIT TO DO CONSTRUCTION WORK

APPLICATION FOR A PERMIT TO DO CONSTRUCTION WORK

In terms of Regulation 3(2) of Construction Regulations 2014

This application shall be submitted with the following documents:

1. **Health and Safety Specification**
2. **Health and Safety Plan**
3. **Baseline Risk Assessment**

1. Name and Postal address and telephone numbers of the client:

_____

_____

_____

2. Details of the Agent:

a) Title, Surname and Initials: _____

b) Identity number/Passport Number: _____

c) Registration number with SACPCMP: _____

d) Office Tel. Number and/or Mobile Number: _____

e) Postal Address: _____

3. Name, postal address and telephone numbers of the appointed principal contractor:

_____

_____

4. Name, postal address and telephone numbers of designers: _____

_____

5. Name, postal address and telephone numbers of the following persons:

a. Construction Manager: _____

_____

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

b. Construction Safety and Health Manager: _____

c. Construction Health and Safety Officer: _____

6. Exact physical address of the construction and site office:

_____

_____

7. Nature of construction work:

_____

_____

8. Expected commencement date:

_____

9. Expected completion date:

_____

10. .Estimated maximum number of persons on the construction site:

_____

11. Planned number of contractors on site accountable to principal contractor:

_____

12. Name(s) of contractors appointed:

_____

_____

_____

13.

_____ _____

Signature of Client/Client's Agent **Date**

14.

_____ _____

Signature of Principal Contractor **Date**

15. Date of Application:

_____

FOR OFFICE USE ONLY

Authorization	Labour Centre	Official Approval Stamp

16. Submitted documents prescribed in Construction Regulation 5(4) (Please Tick √)

CR 5(1 (a)		**CR 5(1)(b)**		**CR 51); (C-S)**	

17.	**Result of the application (Please Tick √)**	**Approved**		**De l ned**	

18. Reason for declining application:

_____

_____

_____

_____

19. _____

Signature of the Supervisor

20. _____

Signature of revoking Officer/Inspector

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Annexure 3

Notification of Construction Work

Occupational Health and Safety Act' 1993 **(Regulation 4 of the Construction Regulations, 2014)** **Notification of Construction Work**
1. (a) Name and postal address of principal contractor: _____ **(b) Name and Tel. no. of Principal Contractor's contact person:** _____
2. Principal Contractor's Compensation Registration number: _____
3. (a) Name and postal address of client: _____ **(b) Name and Tel no. of Client's contact person or agent:** _____
4. (a) Name and postal address designer(s) of the project: _____ **(b) Name and Tel. no. of designer(s) contact person:** _____
5. Name/s of principal contractor's sub-ordinate supervisor(s) on site appointed in terms of 8(2):

_____

6. Nature of construction work:

_____

_____

_____

7. Expected commencement date: _____

8. Expected completion date: _____

9. Estimated maximum number of persons on construction site:

Total: _____ Male: _____ Female: _____

10. Planned number of contractors on the construction site accountable to principal contractor: _____

11. Name(s) of contractors already selected:

_____

_____

_____

Principal Contractor	**Date**
Client's Agent (where applicable)	**Date**
Client	**Date**

- **This document shall be forwarded to the office of the Department of Labour PRIOR TO COMMENCEMENT of work on site.**

Annexure 4

Occupational Health and Safety Act (Act 85 of 1993)

Construction Regulations 2014

Medical Certificate of Fitness

Name of Employee: _____ ID Number: _____

Company Number: _____

	***Possible Exposure** **e.g. noise, heat, fall, risk, confined space etc.**	***Job Specific Requirements** **e.g. operating mobile crane, digging trenches, erecting form work & support work etc.**	***Protective Equipment** **E.g. Dust respirator (Light Duty, Welding Gloves etc.)**
*Occupation E.g. General Worker, Welder, Bricklayer, Steel Fixer, Mobile Crane Operator etc.			

*The Employer to complete the information in the space marked with an * before sending the Employee for a medical examination.

Declaration by the Medical Examiner:

I certify that I have, by examination and testing using the above criteria specified by employer, satisfied myself that the above mentioned employee is fit to perform the duties as described by the employer in the matrix above.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Occupational Medicine Practitioner/Occupational Health Nursing Practitioner (Please Print Name): _____

Signature: _____ Practice Number: _____ Date: _____

Address:

_____

_____

Annexure 5

Tender OHS Management System Questionnaire

This questionnaire forms part of the tender evaluation process. The questionnaire is to be completed by the Contractor tendering and submitted with their tender offer. The objective of the questionnaire is to provide an overview of the status of the contractor's OHS management system. Contractors will be required to verify their responses noted in their questionnaire by providing evidence of their ability and capacity in relevant matters.

Please note that all questions may not be relevant to the contract. The SHEQ Representative shall highlight questions that are mandatory.

- Be advised that if your tender is successful you will be re required to provide:
- A Risk Assessment for the Project
- A Site Safety Plan
- Budget Breakdown
- Job Safety Assessments of Safe Work Method Statements for individual activities that have a medium to high hazard level.

Certification: The information provided in this questionnaire is an accurate summary of the company's occupational health and safety management.	
Company Name:	
Signed:	Name:
Position:	Date:
Contract Details:	
Contract Name:	Contract Number:
Please complete Insurance details in Section 8:	
Name and Contact Details of Vaal Central Water's Representative:	

N/A=Not applicable or relevant to this contract

	Questionnaire	Yes	No	N/A
1	**OHS Policy Management**			
1.1	Is there a written company health and safety policy? **If yes, provide a copy of the policy**	**Yes**	**No**	**N/A**
1.2	Does the company have an OHS Management System certified by a recognised independent authority? e.g. ISO **If yes, provide a copy of contents page(s)**	**Yes**	**No**	**N/A**
1.3	Is there a company OHS Management System manual or plan? **If yes provide a copy of contents page(s)**	**Yes**	**No**	**N/A**
1.4	Are health and safety responsibilities clearly identified for all levels of staff? **If yes, provide a sample(s)**	**Yes**	**No**	**N/A**
	Other Comments:			
2	**Safe Work Practices and Procedures**			
2.1	Has the company prepared Safe Work Method Statements, Safe Operating Procedures or specific safety instructions relevant to the contract? If yes, provide a summary listing procedures or instructions>	**Yes**	**No**	**N/A**
2.2	If the work requires use of Permits and Isolation Procedures: Is the company familiar with Permits and Isolation Procedures? **If yes, provide evidence such as training, operating instructions etc.**	**Yes**	**No**	**N/A**
2.3	Is there a documented incident investigation procedure?	**Yes**	**No**	**N/A**

	If yes, provide a copy of a standard incident report form.			
2.4	Are there procedures for maintaining, inspecting and assessing the hazards of plant operated/owned by the company? **If yes, provide details and samples (evidence of completed maintenance logs, pre-start daily safety inspections, job safety assessments, safe working method statements.**	**Yes**	**No**	**N/A**
2.5	Are the procedures for storing and handling hazardous substances? **If yes, provide details.**	**Yes**	**No**	**N/A**
2.6	Are there procedures for identifying, assessing and controlling risks associated with manual handling? **If yes, provide details.**	**Yes**	**No**	**N/A**
2.7	Are there procedures covering the use of computers and minimising the risk from overuse or related injuries? **If yes, provide details.**	**Yes**	**No**	**N/A**
	Other Comments:			
3	**OHS Training**			
3.1	Describe how employees are inducted in your company. **Provide copy of induction program.**	**Yes**	**No**	**N/A**
3.2	Describe how health and safety training is conducted in your company. **Provide copy of training program relevant to the contract.**	**Yes**	**No**	**N/A**

3.3	Is a record maintained of all training and induction programs undertaken for employees in your company? **If yes, provide examples of safety training records.**	**Yes**	**No**	**N/A**
3.4	Percent of managers and supervisors trained in OHS in last 3 years. Percent of managers and supervisors trained in preparation of risk assessments. Percent of managers and supervisors trained in preparation of jib safety analysis. Percent of workers trained in OHS in last 3 years?	**Yes**	**No**	**N/A**
3.5	Do your employees all applicable licenses/certificates and are appropriately experienced for this work? **If yes, please complete Section 9.**	**Yes**	**No**	**N/A**
4	**Health and Safe Workplace Inspections**			
4.1	Are there regular health and safety inspections at worksites undertaken? **If yes, provide details and their frequency.**	**Yes**	**No**	**N/A**
4.2	Are the health and safety inspections at worksites documented? **If yes, provide examples of forms and completed inspection reports.**	**Yes**	**No**	**N/A**
4.3	Is there a procedure by which hazards are reported by employees and followed up? **If yes, provide copy of procedure or similar evidence.**	**Yes**	**No**	**N/A**
	Other Comments:			

5	**Health and Safety Consultation**			
5.1	Are employees consulted on OHS matters including amenities? **If yes, provide details and samples (toolbox meetings, team briefings, meeting schedules and consultation procedures.**	**Yes**	**No**	**N/A**
5.2	For larger companies: Is there a workplace health and safety committee? **If yes, provide a copy of meeting agenda/minutes.**	**Yes**	**No**	**N/A**
5.3	For larger companies: Are there elected OHS representatives? **If yes, how often does refresher training occur?**	**Yes**	**No**	**N/A**
	Other Comments :			
6	**OHS Performance**			
6.1	Has the company ever been convicted of any occupational health and safety or environmental offences in the last five years, or have any proceedings underway or pending? **If yes, provide details.**	**Yes**	**No**	**N/A**
6.2	Has the company had any government or environmental inspector notices issued in the last 12 months? E.g. prohibition or prohibition notices? **If yes, provide details.**	**Yes**	**No**	**N/A**
6.3	For larger companies: Is there a system for recording and analysing health and safety performance statistics?	**Yes**	**No**	**N/A**

	If yes, provide details and samples (e.g. performance reports, performance statistics over the last 12 months)			
	Other Comments:			
7	**References**			

Most Recent Contracts:	**Contract 1**	**Contract 2**
Contract Description		
Client		
Contact		
Phone Number		

8	**Insurances: Please provide copy of certificate of Currency**				
Insurance	**Insurer/Not Applicable**	**Policy Name**	**Policy Number**	**Expiry Date**	**Coverage**
Workers Compensation					
Public Liability					
Professional					
Professional Indemnity					
Other					

9	**Certificates/Licenses/Industry Training: Please provide copies or samples**			
Licence/Certificate	**Licensee**	**License no.**	**Expiry Date**	**Notes**

NB. After the contractor has met all the requirements of this specification and the relevant legislative requirements a permit to set site shall be issued by the SHEQ Department.

Prepared By	**Signature:**	**Date:**
Reviewed By	**Signature:**	**Date:**
Reviewed By	**Signature:**	**Date:**
Reviewed By	**Signature:**	**Date:**
Approved By	**Signature:**	**Date:**

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Vaal Central Water
SHEQ Department
051 4

VAAL CENTRAL WATER

CONTRACT NO: VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

PART C2: PRICING DATA

VAAL CENTRAL WATER

CONTRACT NO. VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

PART C2: PRICING DATA

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VAAL CENTRAL WATER

CONTRACT NO: VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C2.1: PRICING INSTRUCTIONS

PRICING INSTRUCTIONS (CIVIL WORK)

C2.1.1 PREAMBLE
TO THE BILLS OF QUANTITIES

C2.1.1.1 The method of measurement published by the South African Bureau of Standards in Clause 8 of the Standardised Specifications for Civil Engineering Construction is applicable, subject to the variations and amendments contained in the section ' Applicable SANS 1200 standardised specifications‟

C2.1.1.2 Descriptions in the Schedule/Bills of Quantities are abbreviated and comply generally with those in the Standardised Specifications. Clause 8 of each Standardised Specification, read together with the relevant clauses of the Scope of Work, set out what ancillary or associated activities are included in the rates for the operations specified. Should any requirements of the measurement and payment clause of the applicable Standardised Specification, or the Scope of Work, conflict with the terms of the Schedule/Bill, the requirements of the Standardised or Scope of Work, as applicable, shall prevail.

C2.1.1.3 The clauses in a specification in which further information regarding the schedule/bill item can be obtained appear under "Reference clause” in the Schedule/Bills of Quantities. The reference clauses indicated are not necessarily the only sources of information in respect of schedule items. Further information and set specifications may be found elsewhere in the contract documents. Standardised Specifications are identified by the letter or letters which follow SANS in the SANS 1200 series of specifications, e.g. G for SANS 1200 G.

C2.1.1.4 Unless otherwise stated, items are measured nett in accordance with the drawings, and no allowance is made for waste.

C2.1.1.5 The quantities set out in the Schedule/Bills of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Engineer from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.

C2.1.1.6 The prices and rates to be inserted in the Schedule/Bills of Quantities are to be the fully inclusive prices for the work described under the several items. Such prices and rates shall cover all costs and expenses that may be required in and for the execution of the work described, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based, as well as overhead charges and profit. Reasonable prices shall be inserted as these will be used as a basis for assessment of payment for additional work that may have to be carried out.

C2.1.1.7 A price or rate is to be entered against each item in the Schedule/Bills of Quantities, whether the quantities are stated or not An item against which no price is entered will be considered to be covered by the other prices or rates in the Schedule/Bills of Quantities.

C2.1 1 8 Except where rates only are required, the Tenderer shall insert all amounts to be included in his total tendered price in the 'Amount™ column and show the corresponding total tendered price.

C2.1.1.9The units of measurement described in the Schedule/Bills of Quantities are metric units. Applicable general material and corrosion protection specifications for pipe specials items:

mm	=	millimetre	h	=	hour
m	=	metre	kg	=	kilogram
km	=	kilometre	t	=	ton (1000 kg)
m²	=	square metre	No.	=	number
m².pass	=	square metre pass	sum	=	lump sum
ha	=	hectare	MN	=	meganewton
m³	=	cubic metre	MN.m	=	meganewton metre
m³.km	=	cubic metre-kilometre	PC sum	=	Prime Cost Sum
l	=	litre	Prov sum	=	Provisional sum
kl	=	kilolitre	%	=	per cent
MPa	=	megapascal	kW	=	kilowatt

C2.1.1.10 Pipes, fittings and valves (pipe specials)

Dia	=	diameter	Upvc	=	Unplasticised Polyvinyl Chloride
Mat	=	material	MS	=	Mild Steel
SS	=	Stainless Steel	AS	=	As Specified
c to f	=	centre to face	GMS	=	Galvanised Mild Steel
d.f.	=	double flanged	o.a.	=	overall
p.f.	=	puddle flange	CI	=	Cast Iron
NB	=	Nominal Bore	w.t	=	wall thickness

Applicable general material and corrosion protection specifications for pipe specials items:

a) All mild steel pipes and fittings shall be cleaned and treated with a polyimide-cured epoxy system similar and equal to COPON EP2300 or AMERCOAT 385 coating, externally and internally as specified in Clause 3.9.2.2 of SANS 1200L, to a dry-film thickness of at least 300 micrometres.

b) After installation, all exposed pipes shall be coated with an azure polyurethane enamel paint, to a dry-film thickness of 60 micro- metres.

c) Stainless steel pipes and fittings shall be manufactured from grade 316L stainless steel

d) All bolts, nuts and washers shall comply with the requirements of Clause PSL 3.9. 5 of the Project Specification.

e) All rates shall be consistent for similar items of the same material and diameter. Where amendments are ordered, new rates shall be calculated by direct interpolation between the tender rates for the nearest two similar items. Only when amended or new items fall outside the range of similar items for which rates have been tendered, will new rates be negotiated

f) Unless otherwise stated, the dimensions and drilling of flanges shall comply with the requirements of SANS 1123, Table 16 for pipes with a diameter of 150 mm and smaller and Table 10 for diameters exceeding 150 mm

g) No pipes, fittings or specials shall be ordered unless authorised by the engineer in writing.

The Employer has the right whereas any measurements and/or payments were made before the final Payment Certificate to inspect it and if it is incorrect to correct it. The Employers has the right to remove and correct any work not complying with the specification before the submission of the last Payment Certificate.

VAAL CENTRAL WATER

CONTRACT NO: VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C2.2: SCHEDULE OF QUANTITIES
VAAL CENTRAL WATER

CONTRACT NO: VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C2.3: SUMMARY OF SCHEDULES

SUMMARY OF SCHEDULES

CIVIL SUMMARY		
SCHEDULE	**DESCRIPTION**	**AMOUNT**
A	PRELIMINARY AND GENERAL	
B	GENERAL SITE WORKS	
C	CHEMICAL DOSING BUILDING	
D	RAPID GRAVITY SAND FILTERS	
E	CHLORINATION BUILDING	
F	ADMINISTRATION BUILDING	
G	INTERCONNECTING PIPEWORK AND MANHOLES	
H	MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS	
J	REFURBISHMENT OF CLARI-FLOCCULATOR	
K	RENOVATIONS TO OLD PUMPHOUSE BUILDING	
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF SCHEDULES - a		

MECHANICAL SUMMARY		
SECTION	**DESCRIPTION**	**AMOUNT**
MA	PRELIMINARY AND GENERAL	
MB	CHEMICAL DOSING EQUIPMENT	
MC	FLOW METERS	
MD	RAPID GRAVITY FILTRATION EQUIPMENT	
ME	PUMPING EQUIPMENT	
MF	CLARI_FLOCCULATOR EQUIPMENT	
MG	CHLORINATION EQUIPMENT	
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF SCHEDULES - b		

ELECTRICAL SUMMARY		
SECTION	**DESCRIPTION**	**AMOUNT OF WORK DONE**
EA	PRELIMINARY AND GENERAL	
EB	ELECTRICAL POWER CABLES	
EC	EXCAVATIONS FOR CABLES	
ED	MCC ALTERATIONS AND NEW MCCS	
EF	TELEMETRY	
EG	GENERAL ITEMS	
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF SCHEDULES - c		

SUB-TOTAL (a + b + c)	
Add 10% Contingencies	
SUB-TOTAL with Contingencies	
Add 15% VAT	
TOTAL TENDER AMOUNT CARRIED FORWARD TO THE FORM OF OFFER	

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SECTION C2.4: BANKING DETAILS

FINANCIAL REFERENCES

(a). BANK RATING

1. It is requisite that a bank rating be obtained, bearing an original stamp by the relevant bank.

2. Failure to complete the bank rating Form overleaf may invalidate the tender rating should be based on highest contract value tendered for and the corresponding timeframe.

(b) FINANCIAL STATEMENTS

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

(c) DETAILS OF COMPANY'S BANK

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

DESCRIPTION OF BANK DETAIL	BANK DETAIL APPLICABLE TO COMPANY HEAD OFFICE	BANK DETAIL APPLICABLE TO THE SITE OF THE WORKS
Name of bank		
Branch name		
Branch code		
Street Address		
Name of manager		

DESCRIPTION OF BANK DETAIL	BANK DETAIL APPLICABLE TO	BANK DETAIL APPLICABLE TO THE
Telephone number	( )	( )
Account number		
Bank Rating		

…….. ……..
SIGNATURE OF TENDERER: DATE:

DECLARATION BY BANK MANAGER

This is to certify that the Tenderer has sufficient good standing with this bank that he will, in my opinion, be financially able to complete a contract to the value as entered, by the Tenderer, in Form C1.1 over the specified duration, or such other duration as the Tenderer may offer. In addition, we confirm that, for the amount of the enquiry, the Tenderer is rated Code

…….. ……..
SIGNATURE OF BANK MANAGER: DATE:

Place bank stamp here

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PART C3: SCOPE OF WORK

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UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C3.1: DESCRIPTION OF WORKS

C3.1.1 GENERAL DESCRIPTION

It is the objective of the Employer to solicit tenders from suitably qualified and experienced contractors for the UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS.

The project will provide an opportunity for CIDB-registered contractors to participate in a large infrastructure project. The project is expected to take **10 months** to reach practical completion from commencement, and the Contractor shall be deemed to have based his tender price on this timeline and the time for achieving Practical Completion as specified in the Contract Data. Any material deviations from this program shall be clearly noted in the Contractor's tender submission as an alternative.

The primary objective of the project is to UPGRADE AND REFURBISH OF WINBURG WATER TREATMENT WORKS, which is currently not fully functional. Another objective of implementing this project is to restore the design capacity of 2.4 Ml/d.

Furthermore, it is the Employer's objective to stimulate local economic development through this Contract, and the Contractor will be expected to participate in the process by employing local labour and acquiring plant and materials from local enterprises as far as practically possible. The Contractor's attention is drawn to section T2.2.5 (Form R) – Local Economic Participation (LEP) Claim Form for more details on this important aspect of the Contract.

C3.1.2 Scope of the works

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

The Standard Specifications which form part of this Contract covers work associated with general infrastructure projects and may therefore cover items not specifically applicable to this particular contract. The description of the work contained in this section is merely an outline of the Scope of Works but does not limit the work to be carried out under this Contract. Approximate quantities for each type of activity to be carried out under the Contract are listed in the Schedule of Quantities bound in this volume.

The primary objective of the project is upgrade and refurbishment of Winburg Water Treatment works. The scope of works includes civil, mechanical, and electrical works as outlined below:

Civil Works:

- Preliminary & General
- General Site Works
- Repair Wolwas Raw Water Pipelines (Provisional)
- Modifications to Wolwas Inlet Chamber
- Minor Improvements to Raw Water Pump Station
- New Chemical Dosing Building

- Minor Improvements to Inlet Works
- Repair cracks in Clari-flocculator and unblock Sludge Pipe
- Major Refurbishment of Old Pumphouse Building
- Modifications to Filter Inlet Channel
- New Filter Building
- Provide New Admin Building
- New Chlorination Building
- Repair or Replace all Leaking Pipes (Provisional)
- New Sludge Holding Pond, Drying Beds, and Wash Water Recovery System

Mechanical and Electrical Works:

- Preliminary and General requirements for Mechanical and Electrical works
- Refurbishment and upgrading of the Bulk Electrical Supply to the WTW
- Replacement of Wolwas Dam raw water pump sets, including pipework and New Electrical Control Panel.
- Improvement of Bulk Electrical Supply at Wolwas Pump Station (Provisional)
- Replacement Raw Water Pump sets at Rietfontein Dam, including pipework, valves and minor modifications to existing electrical panel.
- Replacement of raw water and clear water Flow Meters, including associated pipework, cabling, control and instrumentation.
- Replacement of existing Chemical (flocculant) Dosing System, including tanks, testing and repair of installed pumps, pipework, and electrical controls.
- Refurbishment of the Clari-flocculator rotating bridge, scrapers, and paddle mixers, including the supply of one additional paddle mixer
- Supply and installation of a new sludge (knife-gate) valve, including electric actuator and control system.
- Replacement and Upgrading of the Clari-flocculator Electrical Panel
- Major refurbishment of valves and pipework within the filter building, including modifications to the backwash control system.
- Replacement of Chlorination System, including new equipment housed in a new building, complete with safety systems and controls.
- Replacement of Clear Water Pump-sets, including refurbishment of associated pipework, sump level control, and electrical panel modifications.
- Integration of all pumps and process equipment into the telemetry and basic loss control system, including level-based pump start/stop and inhibit logic at
    - WTW
    - Rietfontein Dam pump station
    - Winburg Reservoirs

C3.1.3. Project Deliverables

Project deliverables associated with the scope of works outlined in C3.1.2 are as follows:

a) General Deliverables
- Construction Programme and approved updates
- Method Statements for all major activities
- Health, Safety and Environmental Management Plan
- Quality Management Plan and Inspection & Test Plans
- Monthly progress reports
- Construction records, site diaries, and photographic records
- Material certificates, test results, and compliance documentation
- Commissioning procedures and test reports
- No Works shall be deemed complete until the relevant deliverables have been submitted and accepted by the Engineer.

b) Civil Works Deliverables
- Completed permanent and temporary works executed in accordance with construction drawings
- Inspection and test records for earthworks, concrete works, and structural repairs
- Pressure testing and leakage testing records for all pipelines
- Watertightness testing records for chambers, structures, and canals
- Completion and acceptance records for buildings, ponds, and civil structures
- Updated civil as-built drawings reflecting all constructed works

c) Mechanical & Electrical Deliverables
- Installed and operational pump sets, valves, pipework, and process equipment
- Mechanical installation and alignment records
- Pressure, functional, and performance testing results
- Manufacturer's data sheets and equipment warranties
- Installed and commissioned electrical supply upgrades and control panels
- Electrical testing results and Certificates of Compliance
- Protection settings, test results, and commissioning records
- Panel schematics and wiring schedules
- Installed and calibrated flow meters with calibration certificates
- Control system configuration records

d) Telemetry and Control Integration Deliverables
- Integration of all pumps and process equipment into the telemetry and basic loss control system
- Level-based start/stop and inhibit logic implemented at WTW, Rietfontein Dam Pump Station, and Wolwas Dam Pump Station
- Integrated system testing and acceptance documentation
- Control philosophy, logic diagrams, and configuration records

e) Testing, Commissioning, and Acceptance Deliverables
- Approved commissioning plans
- Mechanical, electrical, and process commissioning test results
- Integrated system performance verification
- Sectional and system completion certificates

f) As-Built and Handover Deliverables
- Complete as-built drawings (civil, mechanical, electrical, and telemetry)
- Operation and Maintenance (O&M) Manuals
- Asset registers and equipment schedules
- Spare parts lists
- Training records
- Defects lists and Defects Liability documentation
- Practical Completion and Final Completion Certificates

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SECTION C3.2: STANDARD SPECIFICATIONS

C3.2.1 APPLICABLE STANDARDIZED SPECIFICATIONS

1. The General Conditions of Contract applicable to this contract are the "General Conditions of Contract for Construction Works, 3rd Edition (2015)", issued by the South African Institution of Civil Engineering and the necessary amendments to the Standard Specifications have been made and included in the Project Specifications contained in this document.

2. The terms "Schedule of Quantities", (used throughout the Standard Specifications) and "Bill of Quantities", (used in all other documents forming part of this contract), are synonymous.

- SANS 1200: Standardised Specifications for Civil Engineering Construction
- SABS 719: Mild Steel Pipes
- SANS 50545 : Ductile iron pipes, fittings, etc.
- ISO 1940-1: Mechanical vibration – Balance quality requirements for rotors in a constant (Rigid) state: Specification and Verification of balance tolerance
- ISO 1940-2: Mechanical vibration – Balance quality requirements for rotors in a constant (Rigid) state: Balance Errors
- ISO 9906: Rotodynamic Pumps: Hydraulic performance acceptance test
- ISO 10816-1: Mechanical Vibration – Evaluation of machine vibration by measurements on non-rotating parts: General Guidelines
- ISO 10816-2: Mechanical Vibration – Evaluation of machine vibration by measurements on non-rotating parts: Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15000 r/min when measures in situ
- ISO 10816-5: Mechanical Vibration – Evaluation of machine vibration by measurements on non-rotating parts: Machine sets in hydraulic power generating and pumping plants
- SANS 719-2011: Electric welded low carbon steel pipes for aqueous fluids (large bore)
- SANS 1123-2015: Pipe Flanges
- SANS 664-3-2011: Wedge Gate and Resilient Seal Valve for Water Works
- SANS 1551-2-2007: Check Valve (Flanged and Wafer Types)
- SANS 1849-2008: Butterfly Valve for General Purposes
- SANS 10142-1: 2017 Edition 2: The Wiring of Premises: Part 1: Low-Voltage Installations
- SANS 10160: basis of Structural Design and Actions for Buildings and Industrial Structures
- SANS 10161: Design of foundations for Buildings

- SANS 2001: Construction Works

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UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

SECTION C3.3: PROJECT SPECIFICATIONS

C3.3.1 SPECIFICATION FOR CIVIL WORKS

The following variations and additions to the Standard and Particular Specifications will be applicable to this Contract.

The various documents listed in section C3.2.1 and C3.3.1 shall be treated as mutually explanatory. However, should any requirement of section C3.3.1 conflict with any requirement of the Standardized Specifications or with any requirement of the Project Specifications, then the requirement of section C3.3.1 shall prevail.

The Standard Specifications do not cover all the different types of work included in the Contract. The general requirements for portions of the Works not covered by the Standard Specifications are described in the Project Specifications. Project Specifications for civil works are included in section C3.3.1

The clauses in section C3.3.1 are numbered "PS" followed by a number corresponding to the number of the relevant clause in the Standard or Particular Specifications. New clauses not covered by clauses in the Standard or Project Specifications, if included here, are also designated "PS" followed by a number. These numbers follow on the last clause number used in the relevant sections of the Standard or Project Specifications.

The variations and additions to the standard specifications listed in Section C3.2.1 are as follows:

		Page No.
PS A	General	C3.3-3
PS AB	Engineer's Office	C3.3-12
PS C	Site Clearance (Amendment 1, 1982)	C3.3-14
PS D	Earthworks (Amendment 1, 1990)	C3.3-15
PS DB	Earthworks (Pipe Trenches)	-
PS DE	Small Earth Dams	-
PS DM	Earthworks (Roads, Subgrade)	-
PS G	Concrete (Structural)	C3.3-24
PS HA	Structural Steelwork (Sundry Items)	C3.3-41
PS L	Medium-Pressure Pipelines	C3.3-46
PS LB	Bedding (Pipes)	C3.3-48
PS LC	Cable Ducts	C3.3-49
PS LD	Sewers	C3.3-50
PS M	Roads (General)	C3.3-52
PS MJ	Segmented Paving	C3.3-53

PS A GENERAL

PS A 3 MATERIALS QUALITY

PS A 3.1 Substitute the second sentence of the first paragraph of A 3.1 with the following:

Materials shall bear the official mark of the appropriate standard.

The Contractor is responsible for the cost of all testing to ascertain that the materials do comply with the relevant minimum requirements and all such costs shall be deemed to be included in the tendered rates. Samples on which control testing is required by the Engineer, shall be delivered free of charge to an approved laboratory. The cost of control tests done by the Engineer and of which the results do not comply with the minimum requirements shall be for the Contractor's account.

The Contractor shall inform the Engineer of any control testing to be done at least 48 hours before such tests are required and must allow in his program for the time necessary for the tests and the processing of the results thereof.
The handling, storage, transport and erection of equipment, machinery and materials shall be strictly in accordance with the requirements of the supplier and or manufacturer.
All materials shall be new and of the best quality available unless otherwise specified.
Materials must function satisfactorily under prevailing climate and weather conditions at the place of installation.

PS A 3.3 **DELAY DUE TO SUPPLY OF MATERIALS**

Add new sub clause A 3.3:

The Contractor shall ensure that the work is not delayed, due to the lack of materials on the site of the Works, by placing orders with suppliers for the required materials timeously.

PS A 3.4 **ORDERING OF MATERIALS**

Add new sub clause A 3.4:

The quantities set out in the schedule of quantities have been determined from calculations based on data available at the time and should therefore be considered to be only approximate quantities. The Contractor shall therefore, verify the quantities before ordering materials of any kind.

No liability or responsibility whatsoever shall be attached to the Employer for materials ordered by the Contractor except if they have been ordered in accordance with written confirmation issued by the Engineer.

PS A 4 PLANT

PS A 4.2 **CONTRACTOR'S OFFICE, STORES AND SERVICES**

Add the following to A 4.2:

The Contractor's site agent or representative must be contactable at all times by phone. Should use be made of radio and/or cellular phone, these must be operational

at all times with sufficient back-up batteries or recharging facilities.

Security of the Contractor's camp and construction site will be the Contractor's own responsibility, and no additional payment will be made if additional security measures (crime prevention, etc.) need to be employed during the contract period.

The Contractor shall make his own arrangements for housing his employees and transporting them to and from the site. The Contractor is responsible in all respects for the housing and transporting of his employees and for the arrangement thereof, and no extension of time due to any delays resulting from this will be granted.

No personnel will be allowed to reside on the site. Only night-watchmen may be on the site after hours."

PS A 4.3 **MEDICAL FACILITIES AND SAFETY EQUIPMENT**

Add new sub clause A 4.4:

The Contractor shall provide a First Aid cabinet fully equipped and maintained with the minimum contents as listed in the Annexure (Regulation 3) to the General Safety Regulations of the Occupational Health and Safety Act (Act 85 of 1993), to deal with accidents and ailments that are likely to occur during the construction period.

The Contractor shall provide personal safety equipment and facilities as required by Regulation 2 of the Genera! Safety Regulations of the Occupational Health and Safety Act (Act 85 of 1993).

The Contractor shall designate his Safety Officer and Qualified First Aider. The Contractor shall give copies of the minutes of the site safety meetings to the Engineer.

PS A 5 **CONSTRUCTION**

PS A 5.1 **SURVEY**

PS A 5.1.1 Setting Out of The Works

Substitute the first sentence of A 5.1.1 with the following:

The works shall be set out as shown on the drawings. Benchmarks will be placed before handing over of the site.

Add the following:

Setting out of the works is the sole responsibility of the Contractor and shall be done from fixed points as indicated on the drawings. The Contractor shall, within two (2) weeks after the site has been handed over to him, ascertain himself of the correctness of all points Any discrepancy shall immediately be reported in writing to the Engineer. Any costs or subsequent costs arising from discrepancies that had not been reported to the Engineer within the aforementioned period shall be the sole responsibility of the Contractor.

Setting out of the works will not be measured and paid for directly, and compensation for the work involved in setting out shall be deemed to be covered by the tendered rates for the various items of work included under the contract.

PS A 5.2 **WATCHING, BARRICADING, ELECTRIC LIGHTING AND TRAFFIC CROSSINGS**

Add the following to A 5.2:

Construction along and across existing roads should be executed in such a manner that both pedestrian and vehicular traffic can be accommodated at all times.

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

All excavations must be marked with drums, reflecting tape and warning signs to satisfaction of the Engineer. The Contractor shall ensure that all OH&S Regulations are adhered to.

PS A 5.4 **PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES**

Add the following to A 5.4:

The Contractor shall as soon as possible after handing over of the site, commence with the detection of existing services, continue with it without interruption and finalise it at least seven (7) days before excavation starts at the particular section

Detected existing services shall also be indicated on the "Record" drawings.

Where the Contractor is responsible for the cost of repairs carried out by the Employer or others, the costs will be recovered by means of a deduction from the Contractor's monthly payment certificate

PS A 5.5 **DEALING WITH WATER ON WORKS**

Add the following to A 5.4:

A high water table is expected and significant dewatering requirements applied to previous contracts at this site. For the purposes of this contract, it must be assumed that the water table is at ground level and that each structure shall require dedicated dewatering measures.

Special treatment of water on site shall, where necessary, be specified separately (refer PS D 5.2.7).

PS A 5.6 **POLLUTION**

The Contractor's attention is drawn specifically to dust disturbance (See PS D 5.1.4.1).

PS A.5.7 **SAFETY**

Substitute A 5.7 with the following:

"Pursuant to the provisions of the Conditions of Contract, and without in any way limiting the Contractor's obligations there under, the Contractor shall at its 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):

(a) Provide to its Employees on the Site of 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 and effective measures to ensure the proper usage of such safety materials, clothing and equipment at all times; and

(b) Provide, install and maintain of 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; and

(c) Implement on the Site of 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; and

(d) Implement all necessary measures as to ensure compliance of the Act by all subcontractors engaged by the Contractor and their employees engaged on the Works; and

(e) Comply fully with all other requirements pertaining to safety as may be specified in the Contract.

The Employer, Employers Agent and the Engineer shall be entitled, although not obliged, to make such inspections on the Site, as they shall deem appropriate, for the purpose of verifying the Contractor's compliance with the requirement 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 inspection and shall make available for inspection, all such documents and records as the Employer's and/or Engineer's representative may reasonably require.

Where any such Investigations reveal, or where it comes to the Engineer's attention that the Contractor is in any way in breach of the requirements of the Act or is failing to camply with the provisions of this clause, the Engineer shall, in accordance with the provision of Clause 5.11 of the General Conditions of Contract, be entitled to suspend progress on the Works or any part thereof until such time as the Contractor has demonstrated to the satisfaction of the Engineer, the breach has been rectified.

The Contractor shall have no grounds for a claim against the Employer for extension of time and/or additional costs if the progress on the Works or any part thereof is suspended by the Engineer in terms of this clause and the Contractor shall remain fully liable in respect of the payment of penalties for late completion in accordance with the provisions of Clause 5.13 of the General Conditions of Contract should the Contractor fail to complete the Works on or before the specified Due Completion Date in consequence of the suspension.

Persistent and repeated breach by the Contractor of the requirements of the Act and/or this clause shall constitute ground for the Engineer to act in terms of Sub-Clause 9.2.1.3 of the General Conditions of Contract and for the Employer to terminate the Contract in accordance with the further provisions of the said Clause 9.

PS A 5.8 **ACCESS TO THE WORKS**

Add the following to A 5.8:

The Contractor shall maintain adequate access to all public and private property at all times unless otherwise sanctioned by the Engineer. Details of the proposed methods of providing access shall be submitted to the Engineer for approval before such access is restricted. Any claims arising from impeded accesses shall be wholly the responsibility of the Contractor

PS A 5.9 **TRAINING OF LOCAL LABOUR**

An aim to this construction project is to provide as many temporary employment opportunities to the community of as possible. It is incumbent on the Contractor to provide the necessary core of artisans, skilled and semi-skilled personnel required to construct, supervise and adequately control the project as well as providing any necessary on-going training in basic construction skills.

PS A 5.10 **WORKMEN's COMPENSATION ACT**

It is a requirement of this contract that all labour employed on the site be covered by the Workmen's Compensation Act. The Contractor is to arrange a suitable method of complying with the Act including the payment of the necessary levies.

PS A 7 **TESTING**

PS A 7.4 **STATISTICAL ANALYSIS OF CONTROL TESTS**

Substitute A 7.4 with the following'

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

PS A 7.5 **PROCESS CONTROL**

Add new sub clause A 7.5:

All test results obtained by the Contractor in the course of his process control of the Works shall be submitted to the Engineer or his representative prior to requesting inspection of the relevant portions of the Works. Any request for inspection shall be submitted on the prescribed forms that will be provided by the Engineer.

The Contractor shall make suitable arrangements for process control prior to commencement with the Works. Should he intend using site personnel for this purpose he shall ensure that suitably trained and competent personnel take charge of the necessary test work and that the necessary equipment is at their disposal prior to commencement of the Works. Failure to comply with these requirements shall be just cause for the Engineer to order suspension of the works without additional remuneration or for him to recommend termination to the Employer.

PS A 8.2 **PAYMENT**

PS A 8.2.1 **Fixed-Charge and Value-Related Items**

Add the following to A 8.2.1:

The sums tendered for fixed charge and value related items would not be increased should extension of time be allowed for completion of the Contract.

PS A 8.2.2 **Time Related Items**

Add the following to A 8.2.2

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

The ratio between the increased amount for a time related item and the tendered amount must be the same as the ratio between the extension of the time for the

completion of the works and the original time allowed for completion of the works.

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

PS A 8 2.5 **Adjusted Payment for Time-related Items**

The payment to the Contractor for time-related items shall be adjusted in accordance with the following formula in the event of the contract being extended by means of a variation order:

$$\text{sum of tendered amounts for time-related items} = \frac{\text{Extended contract period authorised by variation order}}{\text{tender contract period}}$$

The above-mentioned adjustment of the payment for time-related items shall be made in the Completion Payment Certificate and shall be the only payment for additional time-related costs

PS A 8.3 **SCHEDULED FIXED-CHARGE AND VALUE-RELATED ITEMS**

PS A 8.3.5 **Occupational Health and Safety**

Add new payment clause A 8.3.5:

The tendered rates shall include full compensation to the Contractor for compliance with all the requirements of the Occupational Health and Safety Act (Act No 85 of 1993) OHS Act) and the Construction Regulations, 2014 at all times, as described and included in Section C1.2, sub-section 10 of this tender document.

PS A 8.3.6 **Compliance with Environmental Management Plan**

Add new payment clause A 6.3.6:

The tendered rates shall include full compensation to the Contractor for compliance with all the requirements of the Environmental Management Plan, as described and included in Section C5.2

PS A 8.3.7 **Compliance with Environmental Management Plan**

Add new payment clause A 6.3.6:

The tendered rates shall include full compensation to the Contractor for compliance with all the requirements of the Environmental Management Plan, as described and included in Section C3.3.4

PS A 8.3.8 Add New Payment Clause A 8.3.8

The tendered rate shall include full compensation to the Contractor to allow for all the Contractor's staff to attend all compulsory site safety induction that may be required.

PS A 8.4 **SCHEDULED TIME-RELATED ITEMS**

PS A 8.4.5 **Other Time-Related Obligations**

Add the following to A 8.4.5:

(a) Testing ..... Unit: Sum

The cost of all sampling and testing executed by the Contractor or approved laboratory must be included in this amount and no separate payment shall be made for this. This condition also relates to the casting, curing and testing of concrete cubes.

(b) 1 Testing to be done under the Control of

the Engineer. ..... Unit: Provisional Sum

If the Engineer require additional quality control tests to be carried out by any other independent institution payment thereof will take place under this item. The costs for control tests instructed by the Engineer and of which the results do not comply with the minimum requirements shall be for the Contractor's account.

(b) 2 Overhead Costs, Surcharge and Profit on (b)1 above. ..... Unit: %

The tariff is to cover the Contractor's overheads, surcharge and profit on payment made under (b) 1.

(c)1 Addressing Environmental Issues ..... Unit: Provisional Sum

If it is deemed necessary to address environmental issues or conditions other than those stated in the Environmental Management Plan, the Contractor may only carry out the work upon receiving a written instruction from the Engineer. The work will be defined and described by the Engineer and prior agreement will be reached with the Contractor for the payment thereof.

(a) 2 Overhead costs, surcharge and profit on(c)1 above ..... Unit: %

The tariff is to cover the Contractor's overheads, surcharge and profit on payment made under (c)1.

PS A 8.4.6 **Occupational Health and Safety**

Add new payment clause A 8.4.6:

The tendered rates shall include full compensation to the Contractor for compliance with all the requirements of the Occupational Health and Safety Act (Act No 85 of 1993) (OHS Act) and the Construction Regulations, 2003 at all times, as described and included in Section C3 PS8 and PS9 of this tender document.

PS A 8.4.7 **Compliance with Environmental Management Plan**

Add new payment clause A 8.4.7:

The tendered rates shall include full compensation to the Contractor for compliance with all the requirements of the Environmental Management Plan, as described and included in Section C3.3.4 of this tender document,

PS A 8.4.8 **Standing Time Costs**

a) labour ..... Unit : Sum per working day

b) other resources (to be specified by Contractor)

..... Unit : Sum per working day

Standing time for plant will be paid in accordance with the rates as per the day work schedule.

The tendered sum for each item shall include full compensation for all standing time costs of the specified resource of whatever nature and approved by the Engineer, which are not recoverable by way of the provision made in PS A8.2.5 for the adjusted payment of time-related items.

For the purpose of calculating the total standing time cost, a working week shall be held to consist of five working days and a working day of 9 hours.

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

The amount by which the standing time costs is adjusted shall be subject to the contract price adjustment formula as defined in the conditions of contract.

The Contractor shall take note that this payment item shall only apply to delays, which in the opinion of the Engineer, are incurred as a result of riot, commotion, politically motivated sabotage and acts of terrorism or disorder outside the Contractor's control. This item shall also apply to standing time incurred as a result of labour boycotts, except that only sub-items (a) and (c), as applicable, will be paid where the Contractor did not pay his labour for the time boycotted. Costs for delays incurred for all other circumstances shall be treated as provided for in the conditions of contract.

The provision of this clause shall in no way prejudice the right of either the Employer or the Contractor to determine the contract in terms of the provisions of clause 9 of the general conditions of contract.

The Contractor shall take note that no payment will be considered for additional cost or time lost for any daily removal of plant and equipment from the site, any additional costs incurred in protecting his plant and site establishment, or loss incurred in respect of damage to construction plant, equipment and materials supplied and the works.

in the event that GCC 5.13.1 becomes applicable, the time on which such penalties are calculated shall be reduced by the total standing time approved by the Engineer.

PS A 8 5 **PROVISIONAL AMOUNTS DETERMINED BY THE ENGINEER**

PS A 8.5(b) 1 Community liaison officer..... Unit: Prov. Sum

A salary must be paid fortnightly by the Contractor to the person appointed as the Community Liaison Officer for the project. The payment dates will be determined as soon as the CLO is appointed. The monthly rate for the CLO will be R 8000,00.

PS A 8.5(b) 2 Overhead costs, surcharge and profit on (1) above..... Unit: %

The tariff is to cover the Contractor's overheads, surcharge and profit on payments made to the Community Liaison Officer and Clerk of Works and will be calculated as percentage levy on payments. No payments will be made on this item before any payments is made to the Community Liaison Officer and Clerk of Works.

PS A 8.8.4 **Existing Services**

Add the following to A 8.8.4:

Where the Contractor is responsible for the cost of repairs carried out by the Employer or others, the costs will be recovered by means of a deduction from the Contractor's monthly payment certificate. The Employer will attend to the payment of monies due to others.

PS A 8.9 **OCCUPATIONAL HEALTH AND SAFETY**

PS A 8.9.1 Health And Safety Measures .....,.....Unit: Sum

The rate shall cover all costs pertaining to the provision and maintenance for the duration of the contract of the health and safety measures required in terms of Clause S (Principal Contractor and Contractor) of the Construction Regulations {2003) of the Occupational Health and Safety Act. No other sum shall be paid in this respect and Tenderers must therefore ensure that adequate provision has been allowed for.

PS A 8 9 2 Health And Safety Plan.....Unit: Sum

The rate shall cover all costs pertaining to the provision and maintenance for the duration of the contract of the Health and Safety Plan as required in the Construction Regulations (20D3). The rate shall include for all risk assessments required as well as for the development and implementation of safe work procedures and method statements. No other sum shall be paid in this respect and Tenderers must therefore ensure that adequate provision has been allowed for.

PS A 8.9.3 Health And Safety File.....Unit: Sum

The rate shall cover all costs pertaining to the provision and/or collection of data (drawings, design, materials, operation and maintenance manuals etc.) to be contained in the file, co- operation with other parties, compilation and maintenance of the file during the duration of the contract and the handing over of the file to the Client on completion of the contract. No other sum shall be paid in this respect and Tenderers must therefore ensure that adequate provision has been allowed for.

PS A 8.10 **ENVIRONMENTAL MANAGEMENT PLAN**

PS A 8.10.1 Cost of Environmental Management Plan.....Unit: Sum

The sum shall cover the Contractor's initial cost of providing and demonstrating to the Engineer a suitable and sufficiently documented Method Statement based on the Client's documented Environmental Management Plan Specifications as set out under Part C3: Scope of Works (ref. Clause C5.2) of this document.

PS A 8.10.2 Complying with the Environmental Management Plan (EMP).....Unit: Sum

The sum shall cover the time-related cost of whatever nature, for complying with the Environmental Management Plan (EM P) Specifications as set out under Part C3: Scope of Works (ref. clause C5.2) of this document and that is not specifically covered in PS A.8.10.

PS AB: **ENGINEER'S OFFICE**

PS AB 3 **MATERIALS**

PS AB 3.1 **NAMEBOARDS**

Substitute "South African Institution of Civil Engineers" in the first paragraph of AB 3.1 with "South African Association of Consulting Engineers

PS AB 3.2 **OFFICE BUILDINGS**

Add the following to AB 3.2

The office must have an adjacent carport with minimum dimensions of 6 m x 3 m with a free draining, wearing course floor. The roof must be built in such a way that a vehicle will always be shielded against the sun throughout the day. An approved shade net may be used for the sides to comply with above-mentioned requirement.

The office shall be equipped with a dedicated air conditioning unit of sufficient size (capacity) as to ensure the office temperature is maintained at 20°C throughout winter and summer. The ambient outside air temperature may vary between 0 and 400C

The toilet shall be equipped with a hand washbasin.

PS AB 4 **PLANT**

PS AB 4.1 **TELEPHONE**

Substitute AB 4.1 with the following.

The Contractor shall, over and above the telephone for his own use, allow for an amount of R800-00 per month for the cost of cell phone (including 4G or LTE functionality) or the imbursement of Airtime for the Engineer's Representative.

PS AB 5 **CONSTRUCTION**

PS AB 5.1 **NAMEBOARDS**

Add the following to AB 5.1:

Details of the name board are shown on the Drawings

The name boards shall be erected within one month after receipt of the letter of acceptance and shall be placed at the position indicated by the Engineer, and kept in good repair for the duration of the contract and the defects liability period. Any damage to these boards shall be repaired within fourteen days of a written instruction issued by the Engineer. No payment shall be made in terms of the contract prior to the erection of the name boards.

The Contractor will be permitted to erect a maximum of two of his own name boards, in positions approved by the Engineer. The Engineer reserves the right to order the removal of these boards if they are not kept in good repair.

PS AB 5.3 **KEY PERSONNEL**

Add the following to AB 5.3

The Contractor shall inform the Engineer of the person to whom he has assigned duties with respect to the site in terms of the Occupational Health and Safety Act and the person(s) who are in possession of a valid certificate of competency in first aid. The Contractor shall give copies of the minutes of the site safety meeting to the Engineer.

PS AB 5.5 **SURVEY ASSISTANTS**

Substitute "two or more suitably educated survey labourers" in the first sentence of AB 5.5 with "two semi-skilled labourers."

PS AB 5.6 **SURVEY EQUIPMENT**

The Contractor shall provide the following tested and approved survey equipment on site for the duration of the contract and for the use of the Engineer whenever needed:

a) one tacheometer capable of reading to minimum 20 seconds and maximum 6 seconds of arc, plus tripod;

b) one automatic level plus tripod

c) two tacheometer staffs and one level staff, all graduated metrically; and

d) one 5 m and one 100 m tape measure.

The above-mentioned equipment may by arrangement be shared between the Contractor and the Engineer's representative.

The Contractor shall keep the equipment continuously insured against any loss, damage or breakage, and he shall indemnify the Engineer and the Employer against any claims in this regard.

The Contractor shall maintain the equipment in good working order and keep it clean throughout the contract period.

PS AB 8 **MEASUREMENT AND PAYMENT**

PS AB 8.2 **PAYMENT**

Add the following to AB 8:

PS AB 8.2.2 Survey Assistants And Survey Equipment

No payment shall be made for the survey assistants or survey equipment and all costs shall be deemed to be covered by the rates tendered for the Contractor's facilities.

PS C: **SITE CLEARANCE**

PS C 3 **MATERIAL**

PS C 3.1 **DISPOSAL OF MATERIAL**

Substitute the first sentence of C 3.1 with the following:

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

PS C 5 C**ONSTRUCTION**

PS C 5.1 AREAS TO BE CLEARED AND GRUBBED

Substitute the first sentence of C 5.1 with the following:

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

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

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

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

PS C 5.2 **CUTTING OF TREES**

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

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

PS C 5.9 **EXISTING FENCING**

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

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

PSC 8 **MEASUREMENT AND PAYMENT**

PS C 8.2 **SCHEDULE ITEMS**

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

PS C 8.7 Dismantle and Remove Pipelines Unit: m

Substitute the last sentence of C 8 2.7 with the following:

The rate shall include the cost of excavation to expose each pipeline to be removed and for backfilling upon completion

PS D: **EARTHWORKS**

PS D 2 **INTERPRETATIONS**

PS D 2.3 **DEFINITIONS**

Add the following to D 2.3:

Sand (cohesionless and non-cohesive)

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

PS D 3 **MATERIALS**

PS D 3 1.2 **Classes of Excavation**

Add the following to D 3.1.2:

Under this contract soft and intermediate excavation shall be classified together as soft excavation, and hard rock and boulder excavation, where boulders are larger than 1 m^3, shall be classified together as hard rock excavation. Boulders smaller than 1 m3 shall be classified together with soft excavation

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

PS D 3.3 **SELECTION**

PS D 3.3. **General**

Substitute the second paragraph of D 3.3.1 with the following:

The Contractor shall deal in such a way with materials from all excavations for structures and pipe trenches to ensure that usable material is not contaminated with unsuitable material. If usable material is contaminated, such contaminated material shall be removed and replaced with material of standard at least equal to the in situ usable material, all at the Contractor's expense. No additional payment shall be made in respect of this and all relevant costs shall be deemed to be included in the tendered rates

Add the following to D 3: PS D 3.4 SUBSOIL DRAINS

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

PS D 3.4.1 Material For Subsoil Drainage

PS D 3 4.1.1 Pipes

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

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

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

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

PS D 3.4.2 Crushed Stone

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

PS D 3.4.3 Geotextile Blanket

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

PS D 3.4.4 Sand

Sand in subsoil drains shall comply with the requirements of PS D 2.3

PS D 4 **PLANT**

Add the following to D 4:

PS D 4.5 **AVOIDING QUAGMIRE CONDITIONS**

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

PS D 5 **PRECAUTIONS**

PS D 5.1 Safety (Sub-Clause 5.1.1)

PSD 5.1.1 Safeguarding of excavations (Sub-Clause 5.1.1.2)

PSD 5.1.1.2 Insert the following after paragraph (b)(2), before paragraph (c):

The Contractor or his agent or his representative shall not require or allow any person to work under unsupported overhanging material or in an excavation, which is more than 1,5m deep, and any excavation, which has not been adequately supported or braced if there is a danger of the overhanging material or the sides of the excavation collapsing. The support, shoring or bracing to be designed and constructed by the Contractor, shall be strong and sturdy enough to support the sides of the excavation in question.

PSD 5.1.1.3 Explosives (Sub-Clause 5.1.1.3) Add the following:

The use of explosives in the proximity of services is subject to the approval and conditions stipulated by the service authority.

When blasting is permitted, only light charges shall be used. The Contractor shall in all cases be entirely responsible for any damage caused by blasting operations, and shall settle all claims resulting at his own expense.

The Contractor shall also note the following.

(a) Inter-shot delay between rows shall be a minimum of 25 ms.

(b) Charge per delay shall be in accordance with AECI specifications for blasting adjacent to private property.

(c) All underground services shall be treated as structures.

(d) PPV shall not exceed 12 mm/s at a frequency of not less than 10 Hz.

(e) Preference shall be given to the “Handidets” system.

The Contractor shall confirm to al statutory and other regulations regarding blasting and the handling of explosives. All blasting shall be done under the control of persons holding valid blasting certificates for blasting in streets.

The Contractor shall make his own arrangements for the supply, transport and storage of all explosives and detonators in accordance with the requirements of the Chief Inspector of Explosives and the South African Police Services.

Explosives and detonators may be kept on the site outside normal working hours only if proper magazines are installed and maintained in accordance with all requirements of the above mentioned authorities.

No separate or additional payment will be made for blasting. The Contractor shall allow for all blasting costs in his prices for the relevant items of earthworks, excavations, demolitions, etc.

The Contractor shall sign a Blasting Indemnity on award of the contract.

PSD 5.1.1.4 Barricading of Trenches (New Sub-Clau3e 5.1.1.4)

Add new Sub-Clause 5.1.1.4:

The Engineer may request that trenches must be barricaded due to reasons that he sees fit. The barricade will be at least 1,2 metres high and the distance between wire strands will not exceed 200 mm if a wire fence is erected. If a barricade net is

erected the openings in the net will not exceed 100 x 100 mm. The barricade (net or wire fence) will be supported at distances not greater than 1 metres with suitable sturdy supports.

After completion of the work(S) the barricades must be removed completely and no barricading material may be left on site. The barricade will be erected on both sides of the trench with a minimum distance of 5 metres and a maximum distance of 0 metres from the side of the trench.

PS D 5.1.2 Existing Services

PS D 5.1.2.2 Detection, location and exposure Add the following to D 5.1.2.2:

The requirements of PS A 5.4 shall apply mutatis mutandis.

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

PS D 5. 1.2.3 Protection of cables

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

PS D 5.1.4 Nuisance

PS D 5.1.4.1 Dust Nuisance

Add the following to D 5.1.4.1:

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

PS D 5.2 **METHODS AND PROCEDURES**

PS D 5.2.1.2 Conservation of topsoil

Add the following to D 5.2.1.2:

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

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

PS D 5.2.2 Excavation: Add Or Amend The Following Sub-Clauses

PS D 5.2.2.1 Excavations for general earthworks and for structures

Add the following to D 5.2.2.1:

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

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

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

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

PS D 5.2.2.3 Disposal

Substitute the second sentence of D 5.2.2.3 with the following:

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

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

PS D 5,2.2.4 Excavation limits for payment purposes

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

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

PS D 5.2.3.1 Embankments

Add the following to D 5.2.3.1:

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

PS D 5.2.3.2 Backfilling of trenches and backfilling against structures

Add the following to D 5.2.3.2:

Unless otherwise authorised by the Engineer no backfilling or filling against structures shall commence until the concrete has been in place for at least 14 days.

Backfilling around structures shall be compacted to 95 % (100 % for sand) of MAASHTO density. When specified or ordered by the Engineer the backfilling against structures shall be done using

a mixture of soil cement. The mixture shall contain 5 % cement and just sufficient water for it to be placed and compacted like ordinary backfilling material.

Backfilling of all pipe trenches and around structures shall be performed in 150mm thick layers with material approved by the Engineer, Each layer shall be compacted to 93% Modified AASHTO maximum dry density at optimum moisture content with sufficient water added uniformly to ensure that the specified density will be achieved for each layer. Each layer shall be completed before the next is added. Backfi1ling is not measured separately but is included in the tariff for the chambers. All over-excavation must be backfilled by the Contractor with mass concrete of the specified grade at his own cost. Where such over-excavation has been ordered by the Engineer, the backfilling with Concrete Will be measured and paid separately.

PS D 5.2.3.3 Filling under floors

Add the following to D5.2.3:

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

PS D 5.2.4 Finishing

PS D 5.2.4.1 Final grading

Add the following to D 5.2.4.1:

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

PS D 5.2.4.2 Top soiling

Add the following to D 5.2.4.2:

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

PS D 5.2.4.3 Grass or other vegetation Add the following to D 5.2.4.3:

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

a) Grassing

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

PS D 5.2.5.1 Freehaul

Add the following to 5.2.5 1(1)’

Transport for earthworks within 1.5 km radius of the site boundaries shall be

considered freehaul

PS D 5.2.6 Removal Of Unsuitable Material

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

PS D 5.2.7 Dewatering of foundation excavations

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

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

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

PS D 5.2.8 Setting out of excavations

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

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

The Contractor shall provide sets of boning rods, templates and piano wire, for the sole use of the Engineer, for checking the profiles of the excavations. The Contractor shall also provide, set and level all the pegs required to transfer lines and 1evels to the excavation floor in order to control the preparation of the prescribed profiles.

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

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

PS D 5.2.9 Overbreak and over excavation

It is to be expected that during excavations, material will be removed from below the prescribed profiles. In the cases where the excavation floor is formed of materials classified as Rock the additional depth will for purposes of this contract be termed overbreak and can be expected to vary according to the nature of the rock, the jointing planes, the extent of weathering of the rock, the methods and procedures used in the blasting of the rock and the expertise of the personnel undertaking the blasting. In the case where the excavation floor is formed in materials classified as Soft, the additional depth will, for purposes of this contract, be termed over excavation.

PS D 5.2.10 Safety of excavations

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

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

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

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

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

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

PS D 5.2.11 Maintaining the sides of the excavations

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

PS D 5.2.12 Protection of work

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

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

PS D 5.2.13 Material for filling

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

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

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

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

PS D 5.2.14 Source of materials

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

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

PS D 5.2.15 Compaction of in situ material

Where required the in-situ material at the excavation profile or at the surface exposed after the removal of unsuitable foundation material shall be compacted to 93% (ninety-three percent) of the Modified AASHTO to a depth of at least 150 mm below the exposed surface.

Compaction shall be carried out between optimum moisture content and optimum moisture content plus 2% (two percent). Density testing of the compacted in situ material shall be carried out in accordance with Clause E17.

PS D 5.2.16 Filling topsoil

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

PS D 8 **MEASUREMENT AND PAYMENT BASIC PRINCIPLES**

PS D 8.1 Add the following to D 8.1:

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

PS G : **CONCRETE (STRUCTURAL)**

PS G 3.2 **MATERIAL**

PS G 3.2.1 **CEMENT**

Applicable Specifications Substitute G 3.2 1 with the following:

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

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

a) PFA shall be obtained from only one Power Station, from which the PFA has been approved for use in concrete by the SANS.

b) All PFA shall comply with the requirements of SANS 1466.1988.

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

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

PS G 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.

PS G 3.4 **AGGREGATES**

PS G 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). I(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 mm.

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).

PS G 3.5.2 Air-entraining Agents

Substitute G 3.5.2 with the following:

Air-entraining agents shall not be used in concrete.

PS G 4 **PLANT**

PS G 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.

PS G 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.

PS G 5 **CONSTRUCTION REINFORCEMENT**

PS G 5.1 Cover

PS G 5.1.3 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.

PS G 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 2Q 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 units

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

(d) Exposed arises

AI1 exposed arises (i.e. where the angle between adjacent sides is 110° or less) unless otherwise indicated on the drawings, shall be chamfered 20 mm x 20 mm by means of triangular fillets fixed to the formwork.

(e) Repair of concrete

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

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

Concrete filling generally of the same class as the damaged concrete shall be used for holes extending entirely through concrete sections and of such a size as will accept concrete and for holes in mass concrete greater in area than 0,1 m* 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.

PS G 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

PS G 5.2.5 Removal Of Formwork

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

PS G 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 paint be not less than -

(a) 40 mm, or

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

PS G 5.5 **CONCRETE**

PS G 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

PS G 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.

PS G 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

PS G 5.5.1.7 Strength concrete

Add the following to G 5.5.1.7:

The concrete mix shal1 be designed by a specialist organization. No concrete shall be placed until the Contractor's concrete mix design has been approved by the Engineer. The concrete shall have a minimum cement content of 420kg/m3. The Contractor shall submit to the Engineer a statement of the mix proportion proposed, together with a report from the specialist organization, showing the 28 day concrete strength obtained when using the material proposed for the work. The cost of the concrete mix design shall be borne by the Contractor and shall be deemed to be included in the rates for concrete work.

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

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

(a)	Mass concrete under floors and foundations	20 MPa/19 mm
(b)	Blinding layers	20 MPa/19 mm
(c)	Encasing of pipes	20 MPa/19 mm
(d)	Strip foundations	20 MPa/19 mm
{e)	Benching and screeds	20 MPa/10 mm
(f)	All Reinforced concrete	35 MPa/19 mm
(g)	All water retaining concrete.	35 MPa/19 mm

PS G 5.5.7 Construction Joints

Add the following to G 5.5.7.1:

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

made 150 mm above the fillet.

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

PGS 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 seaters shall consist of a two component polyurethane sealing compound complying with SANS 1Q77. Rearguard S-type PVC water stops with centre bulbs shall be installed under floors and Hydrofoil PVC water stops with centre bulbs in walls, as shown on the drawings.

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

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

PSG 5.5.7.4.1 Filled Joints

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

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

PSG 5.5.7.4.2 Sealing of Joints

(a) General

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

(b) Preparation of joints

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

Care shall be taken to ensure that primers or adhesives are applied only to surfaces that are absolutely dry. The primer or adhesive shall be applied strictly in accordance with the manufacturer's instructions. Unless otherwise specified, the primer shall be applied within the temperature range of 10°C to 40°C and the 3ealant shall be applied after the curing period of the primer and within the period during which the primer remains active.

(c) Sealants

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

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

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

(i) Waterstops

(ii) General requirements

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

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

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

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

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

the manufacturer and approved by the Engineer.

PS G 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.

PS G 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.

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.

PS G 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.

PS G 5.5.1 **Watertight Concrete**

Add the following to G 5.5.11:

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

PS G 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 watertight if the drop in water level does not exceed 6 mm in 96 (ninety six) hours in the case of a roofed structure and if no leakage is apparent

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

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

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

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

PSG 5.5.13 **GROUTING**

Add the following to this Sub-Clause:

PSG 5.5.13.1 Materials

(a) Water. Water for grout shall comply with the requirements given in Sub-Clause 3.3 of SANS 1200 G.

(b) Aggregates. Notwithstanding the requirements of Sub-Clause 3.4.1 of SANS 1200 G, the grading of fine aggregate (sand) and coarse aggregate (stone or pea gravel) shall conform to the gradings given in Tables 1 and 2, respectively, below.

(c) Cement. Cement shall be ordinary Portland cement complying with SANS 471

(d) Admixtures. Admixtures shall comply with the requirements of Sub-Clause 3.5 of SANS 120D 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 4,75 1,18 0,3 (300 pm) 0,15(150 km)	100 95 - 100 45 - 65 5 - 15 0 - 5	9,5 4,74 2,36	100 95 - 100 0 - 5

PSG 5.5.13.2 Preparation and procedures

(a) Before a machine or structural bedplate is placed on the concrete the following steps shall be carried out:

1. All defective concrete, laitance, dirt, oil, grease, and loose material shall be removed from the concrete foundation by bush-hammering, chipping, or other means until sound clean concrete is obtained. The surface of the foundation shall be scabbled, but shall not be so rough as to interfere with proper placing of the grout. All foundation bolt sleeves shall be cut out, or cut off flush if the sleeves cannot be removed. The top of the foundation shall be re-shaped if necessary.
2. The underside of each steel base, particularly in the bearing areas, shall be cleaned and any burrs and ragged edges removed before the base is placed in its final location.
3. All holding-down bolt sleeves shall be thoroughly cleaned of any materials that may prevent the grout from flowing freely to the bottom of the bolt sockets.

(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. Skimming shall be kept to a minimum. Steel plates shall be used for packing and shall be ground to the required thickness, where necessary.
2. Before grouting is started all loose dirt, oil, grease, and other foreign matter on the surface of the foundation, the undersides of bedplates, and in the bolt holes shall be removed by means of compressed air or other approved means. The surface of the foundation slab shall be thoroughly saturated with clean water, and all free water shall be removed from the surface and the bolt holes just before the grout is placed.
3. Grouting shall not be carried out until the alignment of all units to be grouted has been checked and approved by the Engineer
4. Special care shall be taken with grouting in hot or cold weather to ensure proper setting and gain of strength and, in the case of proprietary grouting materials, by having ice or hot water available, as the case may be, in accordance with the instructions of the manufacturer. Enclosures shall be provided for the grout such that, until it has set, its temperature will be in the range 15-27°C.

   Shields to protect the grout from the sun and from hot winds shall be provided by the Contractor when so ordered

PSG 5.5.13.3 **Formwork**

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

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

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

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

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

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

The grout shall be placed quickly and continuously to avoid the undesirable effects of over-working. (These effects are segregation, bleeding, and breaking-down of initial set). The method of placement shall be subject to approval. The means of placing the grout shall be such that the grout will completely fill the space to be grouted, will be thoroughly 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) al! excess grout on or about the bedplates shall be removed.

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

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

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

(a) Where the clearance beWeen bedplate and foundation is 25 mm or less: 1 part of Portland cement and 2 parts of sand;

(b) Where the clearance exceeds 25 mm: 1 part of Portland cement, 1 part of sand, and 1 part of pea gravel

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

PSG 5.5.13.7 Non-shrink grout with metallic aggregate.

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

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

PSG 5.5.13.8 Expanding grout with powdered aluminium additive.

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

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. aker the addition of the powdered aluminium.

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

PSG 5.5.13.9 Epoxy grout (epoxy mortar type only).

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

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

When the dummy bedplate is dismantled, the underside shall show a minimum grout contact area of 80o/ 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.

PS G 5.6 **SCREED IN CIRCULAR SEDIMENTATION TANKS**

No screeding of circular sedimentation tank floors shall be allowed unless agreed to by the Engineer. In this case, the contractor shall consult with the Mechanical Contractor, before application of the screed, to obtain advice on the use of the scraper mechanism for a smooth finish to the screed.

PS G 5.8 **NO-FINES CONCRETE**

PS G 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 1063.

PS G 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 t9 means a no-fines concrete with a 19 mm nom inal 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	0.33m^3
NF 19	0.30m^3
NF 13	0.27m^3

PS G 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 contract 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.

PS G 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.

Protection

All no-fines concrete shall be protected from the elements and loss of moisture. Protection against loss of moisture snail 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

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

PS G 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 a predetermined line and level, and any loose and fragmented material shall be removed, and projecting steel cleaned and bent as directed by the Engineer. Where partial demolition is not required but extension work only, the contact surface shall be scabbled and cleaned of all dirt and loose particles.

If dowels are required, they shall be installed in holes drilled into the existing structure, in accordance with the details shown on the drawings, and secured by means of an approved type of epoxy bonding compound such as Epidermis 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.

PS G 6 **TOLERANCES**

PS G 6.2.2 Concrete Surfaces

Add the following to G 6.2.2:

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

PS G 8 **MEASUREMENT AND PAYMENT**

PS G 8.1 **MEASUREMENT AND RATES**

PS G 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

PS G 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.I (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".

PM G 8.2 **SCHEDULED FORMWORK ITEMS**

PS G 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.

PS G 8.2.7 **Chamfers**

Add the following to G 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.

PS G 8.4 **SCHEDULED CONCRETE ITEMS**

Unformed Surface Finishes ..... Unit: m^2

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.

PS G 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.

PS G 8.5 **JOINTS** ..... Unit : m

Add the following to G 8.5:

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

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

PS G 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 (m^3)

(ii) using dry-packed grout Unit: Cubic metre (m^3)

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.

PS G 8.9 **TEST STRUCTURE FOR WATERTIGHTNESS** ..... Unit: Sum

The rate shall cover the cost of all equipment and labour necessary to test the structure for water tightness as described in PS G 5.5.11.1, including the supply of water and filling such structure.

No additional payment will be made for re-testing the structure for water tightness after the repair of leaks

PS G 8.10 **BUILDING PIPES INTO CONCRETE WORK AND GROUTING PIPES INSTALLED**

BY THE MECHANICAL CONTRACTOR ..... Unit : No

The rate shall cover the cost of forming the opening for the pipe, scabbling, cleaning and preparing the concrete surface, providing an approved non-shrink epoxy grout, placing and ramming of it solidly into all voids, formwork and finishing to a smooth watertight surface.

PS G 8.12 **JOIN NEW CONCRETE TO EXISTING**

a) Partia1 demolition (describe) ..... Unit : Sum

b) Scabbling of existing surface ..... Unit m

c) Steel dowels .. Unit : No

The rate for (a) shall cover the cost of partial demolition as described, and of exposing, cleaning, cutting and bending the existing reinforcement, as well as repairing the concrete surface that is to be retained and disposing of waste material.

The rate for (b) shall cover the cost of scabbling the existing surface, as well as the cost of supplying and applying the epoxy bonding compound.

The rate for (c) shall cover the cost of drilling for and supplying and installing the steel dowels, as well as the cost of supplying and applying the epoxy bonding compound.

PS G 8.13 **SEALING OF OPENINGS IN TOP SURFACE OF NO-FINES CONCRETE WITH PLASTER**

a) Plane horizontal ..... Unit: Square metre (m^2)

b) Plane sloping ..... Unit: Square metre (m^2)

The unit of measurement shall be the square metre of sealing of no-fines concrete.

The tendered rate shall include full compensation for supplying for the construction of the plaster work, including the supply of all material, mixing, applying, finishing to a wood-float finish.

PS HA : **STRUCTURAL STEELWORK (SUNDRY ITEMS)**

PS HA 3 **MATERIALS**

PS HA 3.1 **STRUCTURAL STEEL**

The grade of steel shall be 350W.

PS HA 3.3 **BOLTS, NUTS AND WASHERS**

PS HA 3.3.1 Bolts, and Nuts (Other than Friction Grip) Add the following to this Sub-Clause:

All bolts and nuts shall be of grade 4,3 steel. Washers shall be provided at each nut and shall be of the same material (or coating where applicable) to match the bolt and nut. Single coil square section spring washers shall be fitted to all nuts subject to vibration.

Bolts other than jacking bolts shall project not less than 3 mm and not more than 10 mm from the heads of the nuts after tightening.

Holding down bolts to be built into concrete work as well as bolts to be installed above ground level directly above and under water shall all be of stainless steel grade 304. Bolts for flexible couplings and flanges for underground installation shall be hot-dip galvanized in accordance with the requirements of SANS 763. Bolts to be installed inside buildings shall be hot-dip galvanized in accordance with the requirements of SANS 763

Suitable plastic sleeves and/or washers shall be used for protection against corrosion by metallic action.

PS HA 4 **PAINTS AND PROTECTIVE COATINGS**

Unless indicated otherwise corrosion protection to all structural mild steel shall be as follows.

a) Surface preparation ISO 8501-1-1989

b) Two coats of Carbomastic 15 primer or equivalent

c) Two coats of Carboline 134 final coat or equivalent

PS HA 5 **CONSTRUCTION**

PS HA 5.2 **FABRICATION AND ASSEMBLY**

PS HA 5.2.6 **Handrails**

Substitute the first sentence of HA 5.2.6 with the following:

Handrails shall be of the tube and sphere type similar to Monoweld and shall be manufactured by an approved firm specialising in such works from grade 304 L stainless steel or hot dipped galvanized (heavy duty coating), as scheduled or shown on the drawings.

Handrails shall be 1 000 mm high and shall consist of a handrail and a knee-rail, both manufactured of steel tubing of nominal thickness 2,6 mm and of nominal outside diameter of at least 34 mm

Stanchions shall be manufactured pre-formed in one piece and shall be of steel tubing of nominal thickness of 2,6 mm ana of nominal outside diameter of at least 42 mm. The bases of the stanchions shall be manufactured of 150 mm x 75 mm x 12,5 mm flat bars and shall be pre- formed to suit the situation in which they are to be installed (i.e. for platform- or side-mounting, and for horizontal- or sloped-mounting on concrete or steel), and the stanchion spheres shall be pre-formed to suit right angled or other angled intersections), all as shown on the drawings.

Stanchions shall be spaced at intervals not exceeding 1,5 m and shall be fixed with two M16 bolts, washers and nuts each. All joints shall be welded.

Materials shall be as shown on the drawings or as scheduled

PS HA 5.2.11 **Ladders**

Add the following to HA 5.2.11:

Materials shall be as shown on the drawings or as scheduled.

PS HA 5.2.12 **Prefabricated Open Grid Floors**

Add the following to clause 5.2.12.1:

Open grid flooring shall be of a square pattern type of approved manufacture with 40 x 4 mm minimum thickness bearer bars spaced at not more than 40 mm centres and shall be manufactured in grade 304 stainless steel or 3 CR 12 steel (as scheduled or as shown on the drawings). The tendered rate shall include for all cutting into the required panels, banding and for frames detailed below.

Open grid flooring shall be provided with welded frames as scheduled, made of 50 x 50 x 5 mm thick 3 CR 12 steel angle to provide a seating for the open grid Mooring. The net clearance between the side bars of the open steel flooring and the vertical leg of the frame or strip shall be 5 mm per side. The frames shall be complete with 100 x 40 x 3 mm 3 CR 12 steel anchors fixed at SOO mm centres for building the frame into the concrete work.

Pickling and passivation shall be carried out in accordance with the requirements of the Standardized Corrosion and Painting Specification for Civil Engineering Works.

PS HA 5.2.13 **Floor plate Floors**

Substitute HA 5.2.13 with the following:

Materials shall be as shown on the drawings or as scheduled. Add the following Sub-Clauses:

PS HA 5.2.14 **Ground water pressure relief valves**

Ground water pressure relief valves shall be J.K.F. type B or similar approved by the Engineer, 10 mm diameter with 12 mm thick neoprene disc and sealing ring. The body of the valve shall be manufactured from S.G. iron and all bolts and fittings shall be grade 304 stainless steel.

A 110 mm diameter hot dipped galvanized mild steel pipe shal1 be used as a spacer ring when building the valve into concrete work, all as shown on the Drawing

The valves must be designed for a water pressure of at least 6 metres and to maintain a flow rate of 320 litres per minute at a differential head of 1,0 metres.

PS HA 5.2.15 **Weir plates**

Weir plates shall be 6 mm thick and shall be manufactured in 3 CR 12 steel as scheduled or as shown on the drawings. Dimensions and slots for M 10 stainless bolts shall be as shown on the Drawings.

The weir plate shall be fixed to the concrete surface using 8 mm thick neoprene seals.

PSHA 5.2.16 **Penstocks**

All parts shall be designed for the duty required, but the minimum factor of safety against structural failure shall not be less than 3, based on the working stress of the material. In the design, due consideration shall be given to the thickness of materials with regard to corrosion and operating conditions. The force required at a hand wheel or crank to raise a gate or open a penstock shall be in the order of 100 Newton.

The frames and gates of penstocks shall be made of grade 304 stainless steel with a thickness suitable for the duty required but shall not be less than 3,5 mm thick.

All gates shall be well guided with no possibility of jamming. The gates of wall mounted types shall be held uniformly against the side facings of the frames by the action of

adjustable wedges and shall provide drop-tight closure under the conditions as shown on the drawings. Penstocks (any seating condition) shall not spill water over the top or sides of the frame other than through the opening provided in the penstock for the water to pass through All penstocks shall be of the level invert type fitted with renewable seals of a non-biodegradable material on the invert.

Penstocks shall have rising spindles protected by suitable transparent nylon sleeves, the latter providing convenient visual inspection and greasing facilities. Hand wheels shall be of cast iron with diameters to suit operating either directly on the head frame or on a grade 304 stainless steel tubular pedestal to suit the installation depth, as shown on the drawings. Where necessitated by the mass of the gate and/or the pressure against the gate, suitable gearing shall be provided.

All penstocks measured in the Schedules of Quantities shall be supplied and installed by the Contractor under this Contract. In the case of penstocks to be fixed against concrete walls, holding down bolts made of 304 stainless steel must be supplied and installed into the concrete work. The Contractor shall also execute the complete grouting of the penstocks and carry out all necessary adjustments to ensure proper and smooth operation of the penstocks.

PS HA 5.2.17 **Handstops**

All parts shall be designed for the duty required, but fhe minimum factor of safety against structural failure shall not be less than 3, based on the working stress of the material. In the design, due consideration shall be given to the thickness of materials with regard to corrosion and operating conditions. The force required at the handle(s) to raise a gate or open handstop shall not be more than 200 Newton. Should this not be feasible then the handstop gate is to be cut in more than one part, each with its own handle(s) in order to achieve this limit of 200 Newton per section.

The frames and gates of handstops shall be made of aluminium with a thickness suitable for the duty required but shall not be less than 3,5 mm thick.

All gates shall be well guided in frames purpose made to suit their position and duty and shall provide drop-tight closure under the conditions as shown on the drawings. Handstops shall not spill water over the top or sides of the frame other than through the opening provided in the handstops for the water to pass through. All handstop frames shall be extended to the top *oi* the concrete member concerned. Water tightness of handstops shall conform to the requirement that leakage at full water level will not exceed one litre in 15 seconds.

All handstops shal1 be supplied and installed by the Contractor under this Contract. The Contractor shall also execute the complete grouting of the handstops and carry out all necessary precautions to ensure proper and smooth operation of the handstops.

PS HA 8 **MEASUREMENT AND PAYMENT**

PS HA 8.3.2 **Handrails**

PS HA 8.3.2(b) Handrail assembly complete..... Unit: m

Delete the reference to “details given” and add: as specified in Sub-Clause PS HA 5.2.6 (state material to be used)

The tendered rate shall include handrails comprising hand and knee rails installed complete as specified

PS HA 8.3.6 **Corrosion Protection**

Substitute HA 8.3.6 with the following:

The corrosion protection of sundry steel items shall not be measured separately. The cost thereof shall be included in the rate for the related item.

PS HA 8.3.7 Ground water pressure relief valve..... Unit: No

The unit of measurement shall be the number of ground water relief valves installed.

The tendered rate shall include full compensation for manufacture, supplying, installation and corrosion protection as specified, including 110 mm diameter medium class galvanised mild steel pipe which will be used as a spacer ring when building the valve into concrete work.

PS HA 8.3.8 3CR12 weir plates (state size), (refer to drawings)..... Unit: No

The unit of measurement shall be the number of complete weir plates.

The tendered rate shall include full compensation for manufacture of the weir plates, supplying, installation, including self-drilling M10 anchor bolts, cutting s1ots in plates for bolts, supplying and installing 8 mm thick neoprene sealing material between concrete and plate and adjusting after installation to obtain the correct level as shown on the drawings.

PS HA B.3.9 Grade 304L stainless steel penstock .....,. Unit: No

(refer to drawings and clause PS HA5.2.16)

(State size of clear opening, height to hand wheel and whether channel or wall mounted — on seat or off seat)

The tendered rate shall include full compensation for manufacture, supplying, installation of the penstock to suit the position described and shown on the drawings.

PS HA 8.3.10 Aluminium handstops ..... Unit: No

(refer to drawings and clause PS HA5.2.J7) (state size of clear opening)

The tendered rate shall include full compensation for manufacture, supplying, installation of the handstop to suit the position described and shown on the drawings

PS L : **MEDIUM PRESSURE PIPELINES**

PS L 3 **MATERIALS**

PS L 3.1 **GENERAL**

Substitute the first sentence of L 3.1 with the following:

Types and classes of materials shall be as scheduled.

PS L3.8 Loose Flanges

PS L 3.8.4 Substitute the first sentence of the last paragraph of L 3.8.4 with the following:

Bolts and nuts shall comply with the requirements of SANS 135

PS L 3.9 **CORROSION PROTECTION**

PS L 3.9.2.1 Steel pipes of nominal bore up to 150 mm

Add the following to L 3.9.2.1:

The requirements of PS L 3.9.2.2 shall apply mutatis mutandis

PS L 3.9.2.2 Steel pipes of nominal bore over 150 mm

Add the following to L 3.9.2.2:

All mild steel pipes under this contract shall be treated in accordance with L 3.9.2.2(b)(2) on the inside and the outside, with a polyamide-cured epoxy system similar and equal to Copon EP 2300 or Amercoat 385. The Contractor shall furnish the Engineer with certificates of tests in accordance with L 7.4.

Substitute "250 km" in L 3.9.2.2(b)(2) with "300 km"

PS L 3.9.5 Joints, Bolts, Nuts and Washers

Substitute L 3.9.5 with the following:

All joints, bolts, nuts and washers shall be of grade 304 stainless steel, where installed above ground level or below water level. For underground installations, hot dipped galvanised bolts, nuts and washers shall be used.

PS L 3.10 **VALVES**

PS L 3.10.1 Gate Valves

All gate valves shall comply with the requirements of SANS 664 — Figure 2 and shall be suitable for a working pressure of 1,0 MPa unless otherwise specified. All gate valves must be supplied with a square spindle nut, suitable to be used with a valve key.

Gate valves shall have spigot ends unless shown differently on the drawings and shall close clockwise. The direction for opening and closing shall be permanently displayed on the valves. Valves shall have non-rising spindles.

Spindles, spindle nuts and body rings shall be of bronze.

All flanged gate valves shall be drilled according to SANS 1123 Table 16 for valves with a diameter smaller than 150mm and Table 10 for diameters exceeding 150mm.

PS L 3.11 **MANHOLES AND SURFACE BOXES**

PS L 3.11.4 Step Irons

Substitute L 3.11.4 with the following:

Step irons shall consist of polypropylene coated 12 mm high tensile steel such as Calcamite or similar. The installation of the step irons shall be in accordance with the specification of the manufacturer.

PS L 4 **PLANT TESTING**

PS L 4.3 Add the following to L 4.3:

The Contractor must ensure that the test equipment is in good working order and that it is calibrated.

PS L 7 **STANDARD HYDRAULIC PIPE TEST**

PS L 7.3 Test pressure

PS L 7.3.1.2 Substitute L 7.3.1.2 with the following.

The test pressure for field testing shall be 1,5 times the rated maximum working pressure of the pipe e.g. class 4 uPVC pipes shall be tested to 0,6 MPa.

PS L 8 **MEASUREMENT AND PAYMENT**

PS L 8.2 **SCHEDULED ITEMS**

PS L 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.

PS L 8.2.16 Cut Into Existing Mains/Structure.....Unit: No

The cutting into existing mains and structures shall be measured by the number of each type and diameter of pipe cut into. The rate shall include full compensation for all arrangements with the relevant authorities, isolating the existing service, cutting into the existing service to accommodate the connecting fitting, dewatering, excavating, taking steps to prevent the ingress of soil, stones and other material into the existing service, as well as for any liaison with others required and for making good any damage to the existing service and a) material and labour to connect the pipe.

PS LB **BEDDING (PIPES)**

PS LB 1 **SCOPE**

Add the following to LB 1.1:

This specification also covers the bedding required for electric cables.

PS LB 3 **MATERIALS**

PS LB 3.1 **SELECTED GRANULAR MATERIAL**

Substitute LB 3.1 with the following:

Selected granular material shall be an aggregate, sand or granular material, all of a non- cohesive nature and free from any organic material, of which the grading analysis shows 100% passing a 13,2 mm sieve and not more than 5 % passing a 0,075 mm sieve.

In very wet conditions and if so ordered by the Engineer, a non-plastic crushed material with the specification as stated underneath should be used for bedding cradle.

a)	Grading			
	Sieve size (mm)	% going through		
	19,0	100		
	13,2	84		100
	9,5	70		84
	4,75	45		65
	2,36	29		47
	1,18	19		33
	0,600	13	-	25
	0,300	10	-	18
	0,150	6		13
	0,075	4		10
b)	Crusher value			

The aggregate crushing value, calculated at minus 13,2 mm plus 0,5 mm fraction, may not exceed 29.

PS LB 3.2 **SELECTED FILL MATERIAL**

Substitute LB 3.2 with the following:

The requirements of PS LB 3.1 shall apply mutatis mutandis.

PS LB 3.3 **BEDDING**

Add the following to LB 3.3:

All pipes shall be classified as rigid pipes and shall be laid on a Class C bedding except water connections, which shall be classified as flexible pipes. Cable bedding is specified separately.

Suitable Material Available from Trench Excavations

PS LB 3.4.1 Substitute LB 3.4.1 with the following:

The provisos of PS D 3.3.1 shall apply mutatis mutandis.

PS LB 3.5 **BEDDING IN WATERLOGGED CONDITIONS**

In waterlogged conditions, the Engineer may instruct the Contractor in writing to use a bedding cradle comprising single sized 6,7 mm crushed stone complying with SANS 1083

PS LC 8 **MEASUREMENT AND PAYMENT SCHEDULED ITEMS**

PS LC 8.2 Cable Markers Unit: No

PS LC 8.2.8 Substitute LC 8.2.8 with the following:

The rate shall also cover the cost of the end cap and the incisions, concrete marker and a raw wire, as specified in LC 5.10.

PS LD: **SEWERS**

PS LD 3 **MATERIALS**

PS LD 3.1 **PIPES, FITTINGS, AND PIPE JOINTS**

PS LD 3.1.5 uPVC-pipes

Substitute “approved flexible joints” in LD 3.1.5 with “spigot and socket rubber ring joints”

PS LD 3.5 **MANHOLES, CHAMBERS, ETC**.

PS LD 3.5.7 Step Irons

Substitute LD 3.5.7 with the following:

Step irons shall be installed in all manholes deeper than 1,2 m. Step irons shall consist of polypropylene coated 12 mm high tensile steel, such as Calcamite or similar. The installation of the step irons shall be in accordance with the specification of the manufacturer.

PS LD 5 **CONSTRUCTION**

PS LD 5.6 **MANHOLES**, **INSPECTION CHAMBERS**, **ETC**

PS LD 5.6.1 General

Substitute LD 5.6.1(a) with the following.

Manholes shall be of precast concrete sections with an inside diameter of at least 1 000 mm and shall be constructed as shown on the drawings bound into the document.

1. Final cover levels of manholes in roads and paved areas shall be to the same level as the road or paved area.
2. In the veld 100 mm above natural ground level.

If a manhole is positioned at a low point or in a hollow where stormwater infiltration may occur, the manhole cover level must be raised to a level to avoid the danger of infiltration, or to a level as agreed with the Engineer.

If the manhole needs to be raised with more than 300 mm, precast concrete sections with the same diameter shall be installed and sealed with epoxy.

PS LD 5.6.2 Benching

Add the following to LD 5.6.2.3:

Benching for all manholes except those with sand traps shall be in accordance with the drawings bound into the document.

PS LD 5.6.3 Step Irons

Add the following to LD 5.6.3:

Step irons shall only be installed in manholes deeper than 1,2 m.

PS LD 5.6.4 Brick Manholes

Add the following to LD 5.6.4.3:

Walls of brick manholes, as well as the extension of precast manholes above the

concrete roof slab, shall be plastered internally, External plasterwork shall extend to at least 150 mm below ground level. Manholes shall not be extended above the concrete roof slab by more than 300 mm with brickwork.

If manhole covers are raised with bricks, a half-brick recess, as a foothold, shall be left directly below the concrete slab above the step irons.

PS LD 7 **TESTS**

PS LD 7.1 **GENERAL**

Add the following to LD 7.1.5:

All tests shall be repeated after the completion of backfilling of pipe trenches.

PS LD 8 **MEASUREMENT AND PAYMENT SCHEDULED ITEMS**

PS LD 8.2 Manholes

PS LD 8.2.3 Add the following to LD 8.2.3:

Manholes shall be measured complete as indicated on the drawings and the rate shall be alt inclusive for benching, step irons, type 4A CI cover and frame, and it shall make provision for all additional excavation and backfilling.

The depth of manholes as mentioned in the schedule of quantities, shall be measured from the final cover level to the outlet invert level (flow level).

PS LD 8.2.3.3 New manholes on existing pipes ..... Unit: No

The tendered rate shall be all inclusive for the handling of sewage flow, all excavation and backfilling, cutting of pipe and supply and installation of the new manhole, complete as described in LD 8.2.3.1, with finish and benching to accommodate the level difference of approximately 200 mm

PS LD 8.2.11 Connection To Existing Sewers ..... Unit: No

Add the following to LD 8.2.11:

Separate items will be scheduled for each diameter of connecting pipe.

The tendered rate shall include full compensation for connecting the proposed pipe, any additional channelling and benching associated with the connection, cutting the pipe to suit the connection, supplying and building in the short junction pipe, extra couplings, dealing with existing flow, preventing foreign material from entering the sewer and making the connection.

The excavation for pipelines, pipes, backfilling and manholes shall be measured separately.

Where a direct connection is made to an existing pipe, the rate covers all labour involved in opening the existing pipe, the removal of the existing end cap and disconnection at the pipe.

PS M: **ROADS (GENERAL)**

PS M3 **MATERIAL**

PS M 3.2 **RESPONSIBILITY FOR LOCATION**

Add the following to M3.2:

The subbase and base layers of all roads shall be constructed with material from designated borrow areas. The Contractor is responsible for the selection of the material in the borrow areas and if the material in the paving layers do not comply with the minimum requirements it shall be removed and replaced with suitable material at the expense of the Contractor.

PS M 5 **CONSTRUCTION**

PS M 5.1 **SELECTION**

The Contractor shall deal selectively with material in order that suitable material is not contaminated with unsuitable material. If suitable material is contaminated, the Contractor shall replace such contaminated material with suitable material, at his own expense.

PS M 6 **TOLERANCES**

PS M 6.3 **FREQUENCY OF CHECKS**

Add the following to M 6.3:

These checks shall be submitted to the Engineer for his approval.

PS M 7 **TESTING**

PS M 7.3 **ROUTINE INSPECTION AND TESTING**

Substitute M 7.3.3 with the following:

Statistical evaluation of test results shall not be applicable to this contract, and all tests shall meet the specified minimum requirements for the specific material.

PS M 8 **MEASUREMENT AND PAYMENT**

Add the following to M 8 1:

The cost of all routine testing done by the Engineer, and of which the results do not comply with specified minimum requirements for the material, shall be borne by the Contractor.

These costs shall be deducted from the Contractor's monthly payment certificates.

PS MJ: **SEGMENTED PAVING**

MJ 3 **MATERIAL**

MJ 3.1 **UNITS**

PS MJ 3.1.2 Class, Strength and Type

Add the following to MJ 3.1.2

All paved parking areas shall be constructed of 60 mm thick Type S-A class 25 precast concrete blocks (interlocking type). Footpaths shall consist of 60 mm thick Type S-C class 25 precast rectangular concrete blocks. A “Terracotta” colour shall be used.

MJ 5 **CONSTRUCTION**

MJ 5.1 **PREPARATION**

PS MJ 5.1.2.3 Stabilised subbase

Add the following to MJ 5 1.2.3:

The subbase for the parking area shall be stabilised.

PS MJ 5.7 **JOINT FILLING**

Joint filling shall be done with a 1:3 cement-sand mix.

MJ 6 **TOLERANCES**

PS MJ 6.2 **PERMISSIBLE DEVIATIONS**

Add the following to MJ 6.2:

The degree of accuracy shall be degree I

MJ 8 **MEASUREMENT AND PAYMENT SCHEDULED ITEMS**

MJ 8.2 Construction Of Paving Complete..... Unit : m^2

PS MJ 8.2.2 Add the following to MJ 8.2 2

The rate shall also cover the cost of the cement-sand mix as specified in PS MJ 5.7.

PS MJ 8.2.6 Placement Of Pavers in Stead of Painted Lines. ..... Unit :

If required by the Engineer, parking bays and other painted markings on the parking area shall be indicated with tan-coloured paving blocks

The rate shall cover the cost of all material, labour and equipment for the placing of such blocks

PB: BUILDING WORK

PB 1 **SCOPE**

This section specifies the general requirements for the construction of buildings.

PB2 **INTERPRETATIONS**

PB 2.1 **SUPPORTING SPECIFICATIONS**

(a) Project Specification.

(b) SANS 1200 A or SANS 1200 AA as applicable;

(c) SANS 1200 C;

(d) SANS 1200 D or SANS 1200 DA as applicable;

SANS 1200 G or SANS 1200 GA or SANS 1200 GB as applicable

PB 2.2 **GENERAL**

Building work shall be carried out in accordance with the National Building Regulations and Building Standards Act, 1977, and these specifications.

References to specifications and codes of practice of the South African Bureau of Standards shall be taken to be references to the latest edition of such specifications and codes of practice as amended. Where possible the SANS mark shall appear on all articles, materials or items where it is required to comply with such SANS specification

PB 2.3 **COMMERCIAL PRODUCTS**

In all instances where the Contractor handles, stores, uses, applies, or fixes commercial products, the work shall be strictly carried out according to the instructions of the manufacturer of such products.

PB 2.4 **SAMPLES**

The Contractor shall furnish without delay, such samples as called for or may be called for by the Engineer. Materials or workmanship not corresponding with approved samples, may be rejected by the Engineer and shall be removed from the works at the cost of the Contractor.

PB 3 **CEMENT**

PB 3.1 Cement for masonry work comply with the requirements of SANS EN 431-1 and cement for concrete work shall be CEM I Portland cement or CEM III blast-furnace cement complying with the requirements of SANS EN 197-1.

Separate storage facilities shall be provided for the various types of cement.

PB 3.2 **WATER**

Water shall be clean and free from clay, silt, oil, acid, alkali, organic or other matter which would impair the required strength and durability of mortar, plaster or floor screed.

PB 3.3 **LIME**

Lime shall be hydrated bedding mortar lime complying with the requirements of SANS 523.

PB 3.4 **AGGREGATE**

Sand for plaster and mortar shall comply with the requirements of SANS 1090, whereas the aggregates for normal and granolithic floor creeds shall comply with the requirements of BS1199 and BS1201 respectively.

PB 3.5 **BURNT CLAY BRICKS**

Burnt clay bricks shall comply with the requirements of SANS 227 and shall also be equal in all respects to the three samples of each type of brick furnished by the Contractor prior to commencement of the works and as approved by the Engineer.

General purpose (special) bricks shall be used in foundation walls and lintels.

The colour and texture of face bricks shall be as specified in the project specifications. Care shall be taken to avoid damage to arise and faces during transport and handling.

Fire bricks shall be of well burnt refractory fire clay, resistant to spalling and cracking and of same size as the ordinary bricks.

PB3.6 **CONCRETE MASONRY UNITS**

Pre-cast concrete masonry units shall comply with the requirements of SANS 1215 and shall be solid unless specified otherwise in the project specifications.

PB 3.7 **CALCIUM SILICATE MASONRY UNITS**

Calcium silicate masonry units shall comply with the requirements of SANS 285.

PB 3.8 **WALL TIES**

Wall ties shall comply with the requirements of SANS 28

PB 3.9 **AIR BRICKS**

Air bricks shall be well-burnt terra-cotta air bricks in external faces of walls and 250 mm x 150 mm rectangular gypsum air bricks covered with copper mosquito gauze in internal faces.

PB 3.10 **BRICK REINFORCEMENT**

Brick reinforcement shall be hard drawn mild steel comprising two 3,15 mm diameter wires spaced 75 mm apart and 2,8 mm diameter cross wires spaced at not exceeding 300 mm apart welded to main wires.

PB 3.11 **QUARRY TILES**

Quarry tiles shall be of approved quality, even in thickness, truly square, free from cracks, twists and blemishes and uniform in colour and unless otherwise specified, shall be of approved red colour.

PB 3.12 **CERAMIC TILES**

Glazed ceramic tiles for walls shall comply with the requirements of SANS 22 and, unless otherwise specified, shall be white, size 150 mm x 150 mm x 6,5 mm thick.

Ceramic tiles for floors shall comply with the requirements of SANS 1449 and, unless otherwise specified, shall be unglazed, size 240 mm x 115 mm x 20 mm thick and of approved colour.

PB 3.13 **CONCRETE PAVING SLABS**

Concrete paving slabs shall be precast units of grade 25 Mpa/13 mm concrete and shall be of approved manufacture, at least 5D mm thick and sizes 250 mm x 250 mm minimum and 600 mm x 600 mm maximum.

Concrete slabs shall be even in thickness, truly square, free from cracks, twists and blemishes, with a uniform natural cement colour and surface finished smoothly in the mould and shall also be equal in all respects to the samples furnished by the Contractor prior to commencement of the works and as approved by the Engineer.

PB 3.14 **DAMP-PROOF MEMBRANE**

Damp-proof membrane under floors, unless otherwise specified, shall be of polyethylene sheeting complying with the requirements of SANS 952 as Type C-plain surfaces specified therein, 250 microns in dry areas and 375 microns in wet areas.

PB 3.15 **DAMP-PROOF COURSE IN WALLS**

Horizontal and vertical damp-proof course, unless otherwise specified, shall be of bituminous sheeting complying with the requirements of SANS 248 and as Type FV (Fibre Base) sheeting or as Type GH (Hessian Base) sheeting specified therein, or of polyethylene sheeting complying with the requirements of SANS 952 and as Type A-plain surfaces 450 microns or as Type B-embossed surfaces 375 microns as described therein.

PB 3.16 **TREATMENT OF TIMBER**

All timber shall be given a preservative treatment suitable for the duty for which the timber is intended in accordance with SANS code of practice 05, and no untreated timber shall be used. The preservative treatment shall not impair the final finish. The timber shall be impregnated throughout.

When surface coating is specified, the compounds applied on the surfaces of the timber shall form an unbroken film.

PB 3.17 **STRUCTURAL TIMBER**

Structural timber, unless otherwise specified, shall be of South African softwood (pine) complying with the requirements of SANS 563 or SANS 1245 and, unless otherwise specified or shown on the drawings, shall be of Grade 4 and shall be marked as laid down in the specification.

Roof battens and other structural timbers not less than 50 mm or more than 65 mm in width and not less than 38 mm or more than 50 mm thickness, shall be of South African softwood (pine) complying with the requirements of SANS 653.

All structural timber shall bear the full standardisation mark of the South African Bureau of Standards.

The tolerance by which “actual” dimensions may vary from the “nominal” dimensions specified or stated on drawings of South African sawn structural softwood, shall be as laid down in SANS 563, SANS 653 and SANS 1245 where relevant.

PB 3.18 **STRUCTURAL LAMINATED TIMBER**

(a) Stock glued laminated timber of S.A. pine

Stock glued laminated timber of S.A. pine shall comply with the requirements of SANS 1089 and shall be marked as laid down in the specification and shall also bear the standardisation mark of the SANS.

(b) Designed glued laminated timber

Structural glued laminated timber shall comply with the requirements of SANS 876 and shall be marked as laid down in the specification and shall also bear the standardisation mark of the SANS.

The timber shall be of –

(i) softwood or hardwood;

(ii) the density group and grade;

(iii) the exposure category;

(iv) moisture content; and

(v) of Class A or Class B appearance;

as specified and, in services having timbers treated against infestation by insect pests, shall be treated against pests as laid down in the specification for laminated timber.

PB 3.19 **GALVANISED STEEL ROOFING SHEETS**

Galvanised steel roofing sheets shall be of the profile as scheduled or shown on the drawings, of 0,60 mm thick mild steel (before galvanising) and shall be galvanised on both sides to the requirements of SANS 934 for a Class Z250 coating, unless a Class Z600 coating is specified, and shall be passivated.

PB 3.20 **METAL RIDGING FOR STEEL COVERED ROOFS**

Galvanised iron ridging for ridges and hips of steel covered roofs shall be of 0,60 mm thick flat mild steel (before galvanising), galvanised as specified for roofing sheets in clause 3.19

PB 3.21 **FIBRE CEMENT ROOFING SHEETS**

Fibre cement roofing sheets shall be of the profile scheduled or shown on the drawings and shall comply with the requirements of SANS 685. The sheets shall be not less than 6 mm thick.

PB 3.22 **ADJUSTABLE FIBRE CEMENT RIDGING**

Adjustable fibre cement ridging for ridges of fibre cement covered roofs, shall be of same manufacture as the roofing sheets, of not less than 6 mm thick material, with overlapping end joints and shall suit the profile of the roofing sheets. Width of wing shall be not less than 300 mm measured from the centre of roll.

PB 3.23 **FASCIAS AND BARGE BOARDS**

Fascias and barge boards shall be, unless otherwise specified, of pressed fibre cement boards of section described in long lengths.

PB 3.24 **FIBRE CEMENT FLASHINGS**

Fibre cement flashing for horizontal top edges of roofs butting against vertical wall or

other surfaces, shall be of same manufacture as the roofing sheets of not less than 6 mm thick material and with overlapping end joints. The flashings shall suit the profile of the roofing sheets and shall extend not less than 300 mm onto the roof sheeting, shall have plain upstands against the vertical surfaces and shall be flashed over with metal as described.

PB 3.25 **FIBRE CEMENT GUTTERS**

Fibre cement gutters shall be of approved manufacture, of not less than 6 mm thick material and with spigot and socket ends.

Gutter brackets shall be heavy quality galvanised steel or non-ferrous metal brackets as supplied by the manufacturers of the gutters.

PB 3.26 **FIBRE CEMENT RAINWATER DOWN PIPES**

Fibre cement rainwater downpipes shall be of approved manufacture, with spigot and socket ends the material in circular rainwater downpipes 75 mm diameter shall be not less than 6 mm thick, and in circular pipes over 75 mm diameter and in all sizes of square and rectangular pipes, shall be not less than 8 mm thick.

Holderbats for rainwater downpipes shall be heavy quality galvanised steel or non-ferrous metal holderbats.

PB 3.27 **CONCRETE ROOFING TILES**

Concrete roofing tiles shall comply with the requirements of SANS 542, except that the concrete in the body of the tile need not be coloured where tiles have natural stone granular finish, and shall be of pattern and colour specified.

Unless otherwise specified, the tiles shall have natural stone granular finish.

PB 3.28 **COVERING TO CEILINGS**

(a) Gypsum plasterboard ceilings with plaster finish

Gypsum plasterboard for ceilings shall be 6,4 mm thick gypsum ceiling board, complying with the requirements of SANS 266.

The cover strips shall be galvanised or lacquered wire gauze not less than 60 mm wide. The plaster shall be a retarded semi-hydrate wood-fibre plasterboard bonding gypsum plaster.

(b) Fibre cellulose board ceilings

Fibre cellulose board for ceilings shall comply with the requirements of SANS 803 and, unless otherwise specified, shall be 6 mm thick and of flat (unpressed) type.

PB 3.29 **COVE CORNICES TO CEILINGS**

(a) Gypsum plasterboard cornices

Cove gypsum plasterboard cornices to ceilings shall comply with the requirements of SANS 622 and shall be of 82 mm or 120 mm girth as specified.

(b) Timber cornices

Timber cornices to ceilings shall be 32 mm hardwood Scotia's.

PB 3.30 **FLAT FIBRE CEMENT SHEETS**

Flat fibre cement sheets other than fibre cellulose boards described in sub clause 3.28(b), shall comply with the requirements of SANS 685.

PB 3 31 **TIMBER FOR JOINERY**

Softwood for joinery shall comply with the requirements of SANS 1359 and hardwood with the requirements of SANS 1099.

Timber for joinery shall be of clear grade, unless otherwise specified. Counter tops and other tops, where only one face side is visible, shall be of semi-clear grade timber.

PB 3.32 **FRAMED AND LEDGED BATTEN DOORS**

(a) Softwood doors

To be 44 mm thick framed and ledged batten doors complying with the requirements of SANS 545, but the timber shall comply with the requirements of SANS 1359 and shall be of clear grade.

(b) Hardwood doors

To be 44 mm thick framed and ledged batten doors complying with the requirements of SANS 545, but the timber shall comply with the requirements of SANS 1099 and shall be of clear grade. The hardwood shall be solid without any laminations.

PB 3.33 **FLUSH DOORS**

Flush doors shall be solid laminated, chip core or hollow-core as specified and shall comply with the requirements of SANS 545 All glue used in the manufacture of the doors shall comply with the requirements of the above specification.

Unless otherwise specified, face veneers shall be rotary cut, and shall be of timber specified or where doors are to be painted shall be of timber suitable for painting.

Edge-strips to conceal the vertical edges of doors shall be not less than 10 mm thick and of the same timber as face veneers; edge strips to meeting edges of doors in two leaves where edges are to be rebated, shall be not less than 20 mm thick.

Faces of doors shall be machine-sanded to a smooth and even surface.

All glueing together of core strips and glueing on of veneers, edge-strips, etc. shall be done under hydraulic pressure.

The top and bottom edges of doors showing end grain, shall be sealed with lacquer, or other suitable material, before leaving the manufacturer’s works, and similarly sealed after doors are fitted into frames if the edges of doors are disturbed during fitting

PB 3.34 **IRONMONGERY**

All ironmongery shall be of best quality and shall be approved by the Engineer, before fixing. Screws for fixing of articles shall be of similar metal than the articles.

Locks shall comply with the requirements of SANS 4 and shall be supplied with two keys each.

Unless otherwise specified, interior and exterior doors shall be fitted with two and four lever heavy- duty mortice locks respectively, which shall be master-keyed.

No key shall pass a second lock. On no account shall the keys be delivered with the doors or locks to the building site. Failure to observe these instructions may entail the provision of new locks and keys.

PB 3.35 **HOT-DIP GALVANISING TO STEELWORK**

Where prescribed, all steelwork built in as the work proceeds, shall be hot-dip galvanised after fabrication and before leaving the manufacturer's works, in accordance with SANS 763.

Where they occur, site welds shall be zinc sprayed in order that the zinc coating be even and continuous over all surfaces.

PB 3.36 **PRESSED STEEL DOOR FRAMES**

Pressed steel door frames shall comply with the requirements of SANS 1129 and shall be constructed of 1,6 mm thick mild steel sheeting, pressed or rolled to the required shapes, properly mitred, welded and reinforced

Frames shall be of widths required to suit the thickness of walls into which they are built and shall be fitted with suitable tie-bars and braces at bottom, and lugs for building in, three to each jamb of frames without fanlights and four to each jamb of frames with fanlights.

Where fanlights are shown over doors, the frames shall be fitted with transoms of pressed or rolled steel sheet as above and rebate for fanlight s and for doors if required.

The rebates in frames and transoms for doors and fanlights shall be of width required to suit the thickness of doors and fanlights.

Frames shall each be fitted in the rebate of one jamb with a pair of approved 100 mm steel butt hinges, and transom to opening fanlights hung at bottom shall each be fitted with a pair of approved 75 mm steel butt hinges, all set flush into recesses in frames and either fixed with countersunk screws or securely welded on.

Frames shall be holed as and where required for screws fixing fanlight openers, keeps of spring catches, etc. Where fanlights are shown to be fixed into frames, the frames shall be holed in the rebates, for screws, securing the fanlights, four to each frame.

Frames shall each be fitted in one jamb, with approved chromium plated or stainless steel (unless otherwise specified) adjustable striking plate keep, boxed in at back of frame with sheet metal box welded on, and not less than two rubber buffers.

AII welding shall be cleaned off smooth and flush on exposed faces and frames shall be cleaned and primed as described for steel windows before leaving the manufacturer's works

PB 3.37 **STEEL DOORS, SIDELIGHTS AND FANLIGHTS**

Steel doors, sidelights and fanlights shall, in the case of stock types, comply with the requirements of SANS 727, and in the case of purpose made types with the constructional and other requirements of the above specification wherever applicable, and shall in addition be equipped with the following

(a) Suitable weather bars where required to render doors, etc., perfectly watertight;

(b) Suitable lugs, or holes at the same spacing as the standard fixing lugs, for screwing frames to *plugs* in the concrete, where frames of doors, etc. are to be fixed to concrete columns, beams, etc.,

(c) A primer as described for steel windows, except where hot-dip galvanising is prescribed.

Doors, sidelights and fanlights, unless otherwise shown shall be of "one piece" construction, but where shown to be in two or more "one piece" *units,* the units shall be coupled together with standard coupling-mullions and/or transoms.

Bottom openings in doors and sidelights shall be fitted with kicking plates of one thickness of 1,6 mm thick mild steel sheet fixed with metal beads.

Frames of outward opening doors shall be fitted at bottom with sills of door framing section (stepped sills) and of inward opening doors with metal ties, welded to frames, for embedding in thresholds (flush sills).

Stock doors, sidelights and fanlights shall be of the types shown on drawings and purpose made doors, sidelights and fanlights shall be constructed to the forms and sizes shown on drawings.

Unless otherwise specified, the doors shall be of not less than 33 mm universal sections and the sidelights and fanlights of standard 25 mm sections.

Fanlights shall be hung and fitted as described for steel windows in clause 3.39.

PB 3.38 **BALANCE TYPE STEEL DOOR**

The balance type steel door shall be of the "back track" type tip-up door, constructed of not less than 0,8 mm thick mild steel sheeting, pressed to form troughed or fluted pattern horizontal panels, each approximately 200 mm wide, all strongly reinforced at back with 1,2 mm thick top hat section mild steel braces and/or stiffeners and provided all round exposed edges with 1,2 mm thick mild steel channels, all properly welded together and with all welding cleaned off smooth and flush.

The door is to be hung on two galvanised flexible steel cables of not less than 5 mm diameter, connected at lower ends to 125 mm diameter steel encased counterweights of such length and mass as will balance the door in the full open position and connected at upper ends to door unit by passing cables over 140 mm diameter bushed cast aluminium pulleys, securely fixed to 2,50 mm thick mild steel top plates.

The movement of door is to be controlled by means of sintered metal rollers, (nylon rollers are not acceptable) securely fixed at top and centre of outer edges to door unit to operate in horizontal and vertical runner guides respectively. The guides are to be formed of 37 mm x 32 mm x 25 mm mild steel channels and with vertical channels fitted at upper ends with horizontal channels, welded on to form back track for top rollers. Each vertical channel is to be four times bolted to jamb of door opening and each horizontal channel is to be secured in position to internal wall with mild steel angle bracket, twice bolted to wall to form rigid construction.

The counterweights to door to be encased with 2,50 mm thick mild steel cover plates,

each the full height of door and securely fixed to wall and channel guide.

Door to be fitted near bottom with cast aluminium lifting handle for operating the door and with chromium plated locking handle, complete with control rods and with striking plate bolted to lintel, over door opening. The locking handle is to be operated from outside and is to be provided with two keys.

Before leaving the manufacturer's works, all metal is to be given a protective priming coat of paint in accordance with the requirements of SANS 909.

STEEL WINDOWS

Stock residential and industrial type steel windows shall comply with the requirements of SANS 727 and all other types both stock and purpose made shall comply with the constructional and other requirements of the above specification wherever applicable, and shall in addition be equipped with the following:

(a) Suitable weather bars where required to render the windows perfectly watertight.

(b) Suitable lugs, or holes at the same spacing as the standard fixing lugs, for screwing frames to plugs in the concrete where frames of windows are to be fixed to concrete columns, beams, etc.;

(c) Windows and components, except where specified to be hot-dip galvanised, shall before leaving the manufacturer's works, be cleaned by acid pickling rinsing and drying, as laid down in SANS code of practice 064, or by other approved means, to remove all scale, rust, grease, oil and foreign matter and then primed with red oxide zinc chromate primer complying with the requirements of SANS 909, applied by dipping or by means of spray

Ventilators hung at side to open out in windows above ground floors and not accessible for cleaning from an adjoining opening ventilator in the same window or from verandas, balconies and the like, shall be hung on projecting hinges.

Windows, unless otherwise specified, shall be of "one piece" construction, but where shown to be in two or more "one piece" units, shall be coupled together with standard coupling mullions and/or transom s.

Windows shall be fitted with solid brass handles, stays, catches and other fittings, those to windows constructed of universal sections having polished finish and to all other windows rumbled finish. The fittings shall be fixed in such a way as to be removable after windows are glazed.

RESILIENT FLOOR FINISHING S

Semi-flexible vinyl (vinyl-fibre) floor tiles shall comply with the requirements of SANS 581; flexible vinyl (PVC) floor tiles and sheeting shall comply with the requirements of SANS 786 and thermoplastic (asphaltic) floor tiles shall comply with the requirements of SANS 586, Unless otherwise described, the flooring shall be of marbled pattern and of approved light colour and tiles shall be 230 mm x 230 mm or 250 mm x 250 mm in size.

Vinyl cove skirtings shall be of approved manufacture and colour and unless otherwise stated, 70 mm in height.

GLASS FOR GLAZING

Glass for glazing shall comply with the requirements of CKS 55.

Glass not exceeding 0,75 square metre surface area of glass pane, shall be flat drawn clear sheet glass of “QQ” quality (ordinary glazing quality) and of 3 mm thickness.

Glass exceeding 0,75 square metre and up to 1,5 square metres surface area of glass pane, shall be clear float glass of “GG” quality (glazing quality) and of 4 mm thickness.

Laminated safety glass for glazing shall be of “SQ” quality (selected glazing quality) and of 6 mm thickness unless otherwise specified. If high impact strength glass is used, whether cut to size or not, the stencil mark is to appear in a prominent place on the glass.

Toughened safety glass for glazing up to 3 square metres shall be, unless otherwise specified, of 4 mm thickness and must be ordered to the correct size as toughened glass cannot be cut, and each piece of glass to be marked in a clear and permanent fashion. (For bigger sizes, manufacturer’s instructions are to be followed).

Any pane of glass installed in any door shall, where not made of safety glass, be not more than 1 m2 in area and shall have a nominal thickness of not 1ess than 6 mm.

Obscure glass for glazing, unless otherwise specified, shall be Arctic or other similar approved figured rolled glass, of a nominal thickness of not less than 3 mm for glass panes up to a surface area of 0,75 square metre and not less than 5 mm over 0,75 square metre.

Putty for glazing shall comply with the requirements of SANS 680, of Type I for glazing in wood and of Type II for glazing in steel windows, doors, etc. Putty used for glazing in unpainted hardwoods, shall be tinted to match the colour of the wood.

PB 3.42 **PAINTS**

API materials for paint work for which South African Bureau of Standards specifications have been published, shall comply with the requirements of such specifications and shall bear the standardisation mark of the South African Bureau of Standards an the container or packing. Materials for paint work for which no SANS specifications have been published shall be of brand and manufacture approved by the Engineer.

All materials for paint work must be brought on to the site in unopened containers, and no adulteration will be allowed.

Undercoats for paint work shall be as supplied by the manufacturer of the paint being used for the finishing coat.

Paints shall be suitable for application on the surfaces on which they are to be applied, and those used externally shall be of exterior quality or suitable for exterior use.

If necessary, paints shall be strained free from skins and similar impurities immediately before application.

The various primers, undercoats, paints and distempers shall comply with the requirements of the specifications quoted hereunder and shall be of the type of grade stated, viz:

(a) Primers

(i) For wood:

SANS 678. Type I shall be used on exterior woodwork and Type III on interior woodwork.

(ii) For metal:

Dip or spray application (red oxide zinc chromate). For steel windows, doors, door jambs, and other articles normally dip or spray primed in the manufacturer's works: SANS 909.

Brush application (zinc chromate). For all metal surfaces primed on site and then painted: SANS 679, Type I

(iii) For structural steel (red lead)

SANS 312, Type II, Grade

(iv) For galvanised iron SANS 912.

(v) For galvanised metal surfaces and surfaces of non-ferrous metals Wash primer (metal etch primer): SANS 723.

(b) Undercoats

For all surfaces under HIGH GLOSS, OIL GLOSS, FLAT and EGGSHELL finishing paints SANS 681, Type II

(a) Paints

(i)	High gloss	SANS 630
(ii)	Oil gloss	SANS 631
(iii)	Flat and eggshell	SANS 515
(iv)	Emulsion paint (interior)	SANS 633, Grade I
(v)	Emulsion paint (exterior)	SANS 634, Synthetic Polymer Base Type, but pure acrylic resin base 1or fibre cement surfaces
(vi)	Aluminium paint	SANS 682, Grade II
(vii)	Roof paint	SANS 683, Type B
(viii)	Structural steel paint	SANS 684, Type B
(ix)	Epoxy tar	SANS 801 (types as specified)

(b) Distemper SANS 322

(c) Varnish for interior use SANS 887, Type I with eggshell finish

PB 4 **PLANT**

PB 4.1 **GENERAL**

The Contractor shall have at his disposal the normal plant necessary for the proper and

neat completion and rounding off of all facets of the building work.

P B 5 **CONSTRUCTION BRICKLAYER**

PB 5.1 **Cement Mortar**

PB 5.1.1 Cement mortar shall, unless otherwise specified, be composed of four parts by volume of sand and one part by volume of cement for normal brickwork, and three parts by volume of sand and one part by volume of cement for reinforced brickwork.

The ingredients for cement mortar shall be measured in proper gauge boxes on a boarded platform and thoroughly mixed. Alternatively mixing may be by means of an approved mechanical batch mixer. Only when the dry ingredients have been thoroughly mixed and a mixture of uniform colour has been obtained may the water be added in sufficient quantity to obtain mortar with the required consistency.

Care shall be taken in mixing cement mortar to remove from the mixing machine or platform any old mortar that has already set, as such mortar must not be incorporated in any new batch

Cement mortar shall be produced in such quantities as can be used before commencing to set, as no cement mortar that has once commenced to set shall be used in any way.

PB 5.1.2 **Brickwork**

Brickwork, wherever practicable and not otherwise specified, shall be built in English bond. No false headers shall be used, and none but whole bricks employed, except where legitimately required to form bond.

The brickwork, unless otherwise specified, shall be built in 4:1 cement mortar. Brick arches and brick lintels shall be built in 3:1 cement mortar.

The bricks shall be laid on a solid bed of mortar and all joints thoroughly grouted up solid throughout the whole width of each course.

The brickwork shall De carried up in a uniform manner, no portion being raised more than 1,2 m above an adjacent portion.

The bricks shall be well saturated with water, in the stack or dump, approximately two hours before being used. The tops of walls left off, shall be well wetted before work is recommenced.

All rough and fair cutting and cutting of splays, skew backs, chamfers, etc., shall be properly performed.

All necessary openings for pipes, etc., shall be formed or left and made good after pipes, etc., are fixed in position.

Walls generally shall be taken up two courses above panelled ceilings in the same mortar as the wall below and cut between ties, etc.

Where hollow concrete masonry units are used brick-force shall be built into the walls every third course. Mortar for hollow concrete masonry units shall consist of one part cement, two parts lime and nine parts sand by volume. All cavities below floor level shall be filled with Grade 15 Mpa/19 mm concrete.

PB 5.1.3 **Mortar Joints**

Mortar joints to brickwork generally shall be 10 mm in thickness.

The joints in brickwork receiving plaster, tiling or similar finishing's, shall be raked out whilst the mortar is soft to form key for the plaster or mortar backing. The depth of the raking out will depend on the condition of the bricks; the rougher the bricks on face the shallower the raking out and the smoother the bricks the deeper the raking out.

The joints in brickwork shall be flushed off where walls are to be bagged, in readiness for the bagging.

PB 5.1.4 **Brickwork In Thicknesses**

Walls built in two or three thicknesses shall be tied together with and including metal ties of sufficient length to allow not less than 75 mm of each end to be built into brickwork and shall be spaced not more than 1m apart to every third course and staggered.

PB 5.1.5 **Brickwork In Linings**

Linings to concrete shall be tied with and including 4 mm diameter galvanised crimped wire ties of necessary length to allow 75 mm to be bedded into concrete and 75 mm of the other end to be built into brickwork and evenly spaced 1 m apart to every third course and staggered.

PB 5.1.6 **Half Brick Thick Walls**

Half brick thick walls shall be built in 4:1 cement mortar and reinforced with 75 mm wide brick reinforcement, one row to every eighth course in height, and built 100 mm into main connecting walls. The reinforcement shall be lapped 150 mm at end joints, where these are necessary, and 75 mm at angles.

PB 5.1.7 **Cavity Walls**

Cavity walls, unless otherwise specified, shall be built with two half brick thicknesses of brickwork in stretcher bond with 50 mm cavity between, and the two thicknesses tied together with 200 mm long metal wall ties of the butterfly type, spaced at not more than 1 m centres alternately to every third course of brickwork.

Unless otherwise specified, the brickwork shall be built in 4:1 cement mortar.

The cavities shall be carried up from one course of brickwork below damp course level up to two courses below wall plate level, unless otherwise shown or specified, The brickwork above cavities shall be built solid, and where 270 mm thick shall be cut and well bonded where possible. Cavities in foundation walls of cavity walls shall be filled with Grade 15 Mpa/19 mm up to 150 mm below the damp-proof course level.

The cavities shall be kept free of all rubbish, mortar droppings and projecting mortar.

The tops of walls shall be covered with planks or sacking during wet weather to prevent rain from entering the cavities.

The cavities shall not be ventilated.

At door, windows and other openings, the cavities shall be stopped 110 mm back from jambs of openings with the inner thickness of brickwork returned and stopped against the outer thickness and not banded to same. A 110 mm wide strip of damp-proof sheeting as described for damp- proof course in clause 3,15 shall be built in between the two thicknesses in the joint formed by the return and the outer thickness. The damp-

proof strip shall be lapped at least 50 mm on to the sheeting between the two thicknesses of sills and between the two thicknesses of lintels.

Sills to windows shall be divided into external and internal thicknesses with strips of damp-proof sheeting as above, built in line with the damp-proof sheeting in jambs and extending 100 mm beyond the jambs of openings.

The lintels shall be provided with damp-proof sheeting as described under lintels.

Unless otherwise specified, cavities shall be stopped one course below and one course above and 110 mm from sides of openings for air bricks and the like.

PB 5.1.8 **Reinforced Brick Lintels**

Reinforced brick lintels shall be built with sound machine made bricks, in 3:1 cement mortar, with all vertical and horizontal Joints filled solid with mortar throughout the required number of courses and to a distance of at least 330 mm on either side of the clear opening.

The number of courses in lintels over the various size openings shall be as specified in table hereunder, and reinforcing steel wires or rods shall be built into the first horizontal joint over the bottom course as laid down therein, viz.:

LINTELSPAN	NUMBEROF COURSES	REINFORCEMENT
Not exceeding 1 m	4	One row of 75 mm wide brick reinforcement for each half brick width soffit.
Over 1 m to 1,5 m	6	One row of 75 mm wide brick reinforcement for each half brick width soffit.
Over 1 5 m to 2,1 m	7	Three 6,3 mm diameter mild steel rods for each half brick width of soffit.

The reinforcing wires and rods shall be of length at least equal to the width of the clear opening plus 330 mm at each end. The reinforcement shall be evenly spaced in the brick joints, with the outer wires or rods having at least 20 mm cover from face of brickwork.

Brick lintels in 270 mm thick cavity walls shall be built in two half brick thicknesses in stretcher bond, with inner face of outer thickness for a depth of three courses above soffit, covered with sheeting as for damp-proof course, the full length of lintels, and space between the two thicknesses for the depth of the sheeting filled in solid with Grade 15 MPa/19 mm concrete. Where cavities continue above lintels, the sheeting shall be taken up and turned on to top of first course of brickwork to inner thickness of wall, above the concrete filling in lintels.

The lintels, except where built over pressed steel door frames and the like, shall be supported on temporary formwork left in position for at least fourteen (14) days.

PB 5.1.9 **Pre-cast concrete Lintels**

Pre-cast concrete lintels shall be built in overall openings. The lintels shall be the full width of the wall and shall have its ends neatly cut with a cutting disc. Building-in and propping shall be specified by the supplier and brick force- extending at least 350mm to the outside of the opening — shall be built into each of the first five mortar beds above the opening.

PB 5.1.10 **Beam Filling**

Beam filling, unless otherwise specified, shall be half brick thick, built in similar mortar as used in the walls below, cut in between roof timbers and carried hard up to underside of roof covering, and flushed up in mortar.

PB 5.1.11 **Bagged Finish to Brickwork**

Bagged finish to brickwork, if done whilst the mortar in joints is still soft, shall be formed by rubbing over the wall surfaces with wet rough sacking, until all joints and crevices are filled up and an even surface is obtained. Mortar, as used for building the brickwork, shall be added as may be necessary.

If bagging to walls is done after the mortar in joints has set the wall surfaces shall be rubbed over with wet rough sacking as above, but cement grout shall be added as necessary to fill up the joints and crevices and to obtain an even surface

PB 5.1.12 **Building In brick Work**

Ends of timbers, hold-fasts, cramps, gratings, air bricks, dowels, etc., shall be built-in in cement mortar.

Door and window frames and the like shall be set up in positions for building in and securely strutted to prevent distortion whilst the brickwork, lintels, etc., are being built.

Pressed steel door frames shall be grouted in solid at back with cement mortar as the work proceeds.

Wood slips, fixing bricks, hoop iron, roof ties, etc., shall be built in as the work proceeds.

Ventilators shall be built into openings formed in the walls, in 3:1 cement mortar, and grouted in solid with similar mortar and wall finishes made good if disturbed.

Wood frames to doors, windows, etc., shall be set up in position for building in as described and built in as the work proceeds with cramps to jambs of 1,6 mm thick galvanised hoop iron, 32 mm wide, with ends turned 50 mm up against stiles of frames and each twice screwed to frame, and built 450 mm into wall with end turned up into brickwork joint. Cramps shall be built in approximately 0,3 m up from bottom and approximately 0,3 m down from head of frames and intermediately and not exceeding 0,85 m apart. No frame shall have less than two cramps to each jamb irrespective of height.

Cramps to frames in 270 mm thick cavity walls shall be cranked as necessary and built into inner and outer thicknesses of walls alternately.

The stiles of wood door frames, and similar frames not having sills framed in, shall be doweled to concrete, brick, stone and similar thresholds with 10 mm diameter mild steel dowels 75 mm long, one to each stile.

PB 5.1.13 **Securing of Roofs**

Roof trusses shall be fixed at each support to walls with ties of 1,2 mm thick galvanised hoop iron, 30 mm wide, built 750 mm deep into brickwork or embedded 300 mm deep into concrete or wrapped around bottom layer of reinforcing in a reinforced concrete beam and, unless otherwise specified, wrapped over truss and fixed with four galvanised nails, 60 mm long and taken up to and lapped round the nearest purlin and well spiked thereto.

PB 5.1.14 **Bedding And Pointing**

All door, window and similar frames shall be bedded and pointed in 3:1 cement mortar. All wall plates shall be set true and level and bedded in 4:1 cement mortar.

Steel door and window frames shall be carefully pointed all round and made perfectly watertight.

Where steel door and window frames are specified to be pointed with mastic compound they shall be pointed all round externally with an approved waterproof compound, of such composition that it will not stain surrounding surfaces, and that it will adhere tenaciously, remain plastic without sagging or running, be capable of accommodating any normal movement of the joint sealed, and will receive paint without "bleeding". The pointing material shall be forced into the joints, which shall have been previously prepared to receive same, by means of a pressure gun, or by other suitable method, all in accordance with the manufacturer's instructions

PB 5.1.15 **Faced Brickwork**

Faced brickwork shall be built fair and the joints shall be square recessed to a depth of approximately 6 mm, formed with a square jointing tool well pressed into the joints as the work proceeds.

The Contractor shall construct a test section of 10 m2 which shall be approved by the Engineer, before continuing with faced brickwork.

Face bricks shall be sorted by the brick manufacturer at his yard or by the Contractor on the site, to ensure that proper mixing of the bricks within the colour range of each type of facing brick being used is obtained; sudden changes in the general colour of face work in any one type of facing brick will not be acceptable.

Sand in mortar for all faced brickwork shall all be from one source.

Faced brickwork shall be kept perfectly clean and rubbing down of the brickwork shall not be allowed. Scaffold boards shall be turned back during rain to avoid splashing. Soiled brickwork shall be cleaned at the Contractor's expense, and the cleaning method shall be approved by the Engineer.

PB 5.1.16 **Fibre Cement Sills**

Sills shall be in single lengths cut between reveals, fitted with fixing lugs and solidly bedded in 3:1 cement mortar with a slight projection beyond the finished wall face below.

Internal sills shall be level. External sills shall be set sloping on cut brickwork or on fine concrete filling under.

PB 5.1.17 **Laying Of Quarry Tiles**

Joints to paving shall be continuous in both directions.

Tiles shall be solidly bedded and jointed in 3:1 cement mortar with joints, unless otherwise specified, 6 mm wide and slightly pointed with a round jointing tool. Tiles shall be well soaked in water before fixing and thoroughly cleaned off after fixing.

Tiles in sills, copings, etc., shall be set with slight projection over finished wall face, and where full tiles do not fit into the length, two cut tiles shall be used, symmetrically placed as directed

PB 5.1.18 **Installation Of Electrical Service**

The Contractor shall embed in the concrete and/or brickwork, as the work proceeds, all conduits, boxes, etc., which will be fixed in position by the electricians, and must cut all necessary chases and holes in walls for conduits and form recesses in walls for distribution boards, all in the positions directed, notwithstanding whether the installation of the electrical service is carried out by the Contractor or under a separate contract. Alternatively, distribution boards may be built into walls as the work proceeds, providing prior approval is obtained from the Engineer.

The Contractor shall afford every facility and shall render reasonable assistance to the electricians in carrying out their work, and shall make good where necessary, in all trades, after installation has been completed.

PB 5.1.19 **Installation Of Mechanical Equipment**

Where the installation of mechanical equipment is carried out under a separate contract the Contractor shall arrange for the building in of special fittings, leaving holes and openings or forming chases in floors, walls, etc., for pipes, cables etc., and for the building in of pipes, sleeves, pipe clips, bolts, etc., as required or directed.

All cutting of holes through finished floors, walls, etc., after the concrete or mortar has set, must be avoided as far as possible, and the Contractor must give ample notice to the Engineer who will ascertain the exact positions where pipe sleeves, pipes, pipe clips, etc., are to be built in.

PB 5.1. 20 **Protect And Clean Down Brickwork, Etc.**

Angles of face brickwork, reveals, steps, etc., liable to damage shall be covered up and protected during the progress of the remaining work, and any damage done shall be made good at the Contractor's expense and to the satisfaction of the Engineer.

Face brickwork and brick and tile sills, copings, etc., shall be cleaned down as the work proceeds, and surfaces liable to be soiled by mortar or plaster splashes during the progress of the remaining work shall be covered with paper, pasted on, or by other approved means. At completion of the works the coverings shall be removed and the surfaces again cleaned down to the satisfaction of the Engineer.

Any detergent or other materials used in the cleaning down of face brickwork, etc. , shall be of such nature that will not harm adjoining paint and other finishing's in any way

All tile and other pavings shall be thoroughly cleaned off after laying to remove all traces of mortar and other substances, covered up and protected from damage during the progress of the works, and again cleaned off at completion.

PB 5.2 **TILER**

PB 5.2.1 Laying Of Glazed Ceramic Wall Tiles

The tiles shall be fixed direct to walls in 3:1 cement mortar with horizontal and vertical joints continuous, and shall have all joints rubbed in solid with neat white cement grout. Tiles shall be well soaked in water before fixing and thoroughly cleaned off after fixing,

Unless otherwise specified, the wall tiling shall project approximately 4 mm beyond face of adjoining plaster with all exposed edges finished with glazed rounded edge tiles.

Tiling shall be returned into reveals of openings and on to windowsills, and shall be butted at internal angles and provided with glazed rounded edged tiles to external angles, unless otherwise specified.

All necessary cutting to tiles shall be properly performed. Walls shall be well wetted before tiling is commenced.

PB 5.2.2 Laying of Ceramic Floor Tiles

Ceramic tiles shall be bedded to a true and even surface on 3:1 cement mortar and with joints not exceeding 2 mm wide.

After the tiles have been allowed to set for a period of not less than twenty four hours the joints shall be grouted in to with approved epoxy compound, or acid proof cement mortar.

PB 5.3 **PLASTERER AND PAVER**

PB 5.3.1 Cement Plaster

Cement plaster for one coat work on walls shall be composed of four parts of sand and one part of cement for internal work, and five parts of sand and one part of cement for external work, all by volume, and mixed as described for cement mortar in clause 5.1.1.

Cement plaster on concrete surfaces shall be composed of three parts by volume of sand and one part by volume of cement.

PB 5.3.2 Forming key to Concrete for Plaster Finish

All surfaces of concrete receiving plaster, or similar finishing's, shall be well wetted and wire brushed immediately after the formwork is removed and slushed over with 2:1 cement grout to form key for the finish, to the approval of the Engineer. The slushing to be allowed to set hard before the finish is applied

Other methods may be used if approved by the Engineer.

Particular care shall be taken in forming the key for plaster where steel shuttering is used, and if considered necessary the surface of the concrete shall be hacked.

PB 5.3.3 Thickness Of Plaster

Plaster on walls shall be not less than 12 mm or more than 20 mm in thickness, and plaster on concrete ceilings and beams shall be not less than 9 mm or more than 16 mm in thickness, unless otherwise specified.

PB 5.3.4 Application Of Plaster

Walls shall be well wetted before plastering is commenced.

The surfaces of internal plaster shall be steel trowelled to a smooth, even and true finish. External plaster shall be finished to a true and even surface with a wood float. All plaster surfaces shall be free from blemish.

Plaster shall be returned into reveals and soffits of openings, and all angles shall be true and straight with salient angles slightly rounded.

The rendering coat of plaster in two coat work shall be approved by the Engineer before the setting coat is applied, and notice shall be given to the Engineer when it is ready for inspection.

All cracks, blisters and other defects shall be cut out and made good and the whole left perfect at completion.

NB - See clause 5.3.2 for forming key for plaster on concrete.

PB 5.3.5 Normal Screeds to Floors

Concrete sub-floors finished with wood mosaic, vinyl sheeting and tiles, and similar finishing's, shall be screeded with 3:1 cement mortar, of thickness required, but in no case less than 12 mm, and steel trowelled to a true and smooth surface suitable to receive finishing's.

The screeding shall be laid before the concrete sub-floors have matured otherwise the exposed surfaces of concrete shall be thoroughly cleaned with a wire brush, and a coat of neat cement grout applied immediately before the screeding is laid.

The screeding shall be laid in good time to allow of it being perfectly dry when the finishing's are laid.

No traffic shall pass over nor shall any building operations take place on the screeding without proper covering first being provided.

PB 5.3.6 Granolithic Screeds

Granolithic screeds shall be composed of two parts by volume of cement and three parts by volume of aggregate with sufficient water added to obtain a consistency as dry as may be practicable. The screed shall be rendered with a wood float and struck off with a steel trowel after set has commenced.

Granolithic screeds to floors, treads of steps, thresholds, and similar horizontal surfaces unless otherwise specified, shall be not less than 25 mm thick. Granolithic screeds to stair risers, sides of kerbs, and other vertical surfaces, shall, unless otherwise specified, be not less than 20 mm thick. Exposed salient angles of granolithic screeds shall be neatly rounded to approximately 20 mm radius, unless otherwise specified.

The granolithic screeds shall be laid before the concrete sub-floor has matured otherwise the exposed surface of concrete shall be thoroughly cleaned with a wire brush, and a coat of neat cement grout applied immediately before the granolithic screed is laid.

The granolithic screeds shall be laid in panels not exceeding 9 m2 in area, and joined to lines of panels and lined into smaller squares as directed with sunk V-joints. The joints between the panels shall coincide with joints in the concrete sub-floor where possible.

Where granolithic screed is to be tinted it shall be laid in two layers, a lower layer laid

to within 6 mm of the finished level, and an upper layer into which the requisite quantity of approved colouring pigment shall have been mixed. No dusting on of colouring material will be allowed.

All granolithic work shall be done by experienced workmen, and shall be protected from injury caused by rain or other extreme weather for twelve hours after being laid, and against too rapid drying whilst hardening, by being covered with wet sacks, or other suitable material, and shall be protected from injury and discolouration during the progress of the remaining work.

Edges of granolithic floors butting against different floor finishing's, and edges of margins, etc. shall be true and sharp, and shall be protected by fixing temporary wood strips, which shall remain, in position until the commencement of the laying of the adjoining flooring material.

PB 5.3.7 Reedings To Steps, Etc.

The treads of granolithic finished steps and upper surfaces of granolithic finished external thresholds shall be rendered non-slip by reeding same near front edges for a width of 100 mm stopped 100 mm from ends.

PB 5.3.8 Power Floated Finish

Power floated finish to floors etc., unless otherwise specified, shall be floated mechanically to smooth and even surfaces before the concrete has set. Small surfaces and inaccessible places to be floated by hand in a similar way. Under no circumstances is cement mortar to be added while floating the concrete.

PB 5.3.9 Laying Of Concrete Paving Slabs and Paving Bricks

Concrete paving slabs and paving bricks shall be bedded and pointed on a layer of 30 mm clean

dry river sand. Joints shall be 6 mm wide, continuous in both directions, filled solidly with 3:1 cement mortar and slightly pointed with a round jointing tool. Lengths in excess of 10 metres shall be provided with expansion joints.

PB 5.4 **WATERPROOFING**

PB 5.4.1 Damp-Proof Course In Walls

The damp-proof course shall be the full thickness of walls above foundations and shall be laid without longitudinal joints, at end joints, angles and intermediate junctions the sheeting shall be lapped 150 mm.

Where so specified all laps in the damp-proof course shall be sealed over the whole area of laps, to an approved method. Care shall be taken not to tear or otherwise damage the sheeting.

PB 5.4.2 Damp-Proof Membrane

The damp-proof membrane under floors, etc., shall be laid in the widest practical widths to minimise joints and shall be turned up, dressed to load bearing walls and if applicable lapped with the damp- proof course in the walls. All joints shall be sealed with pressure sensitive tape applied over the leading edge of the joint.

PB 5.4.3 Expansion Joints

Expansion joints shall be at least 10 mm wide and filled in with approved bitumen impregnated soft board or closed cell expanded polyethylene strip. Expansion joints shall be sealed with a two-component poly-sulphide joint sealer, 12 mm deep, according to instructions of the manufacturers.

PB 5.5 **CARPENTER AND JOINERY**

PB 5.5.1 Protection Of Timber on Site

Timber stored on site shall be properly stacked when received and adequately protected against extremes of weather and exposure to the sun, until required for use.

PB 5.5.2 Wrought Faces

Exposed woodwork, unless otherwise specified, shall be wrought to a smooth surface, and properly sand-prepared to remove all machine or other tool marks.

For each wrought face on structural timber, an allowance will be made off the "nominal" dimensions specified or stated on the drawings, as follows:

(a) 2,5 mm for "nominal" dimensions up to and including 76 mm;

(b) 3,5 mm for "nominal" dimensions over 76 mm

For each wrought face on joinery timber, an allowance will be made off the "nominal" dimensions specified or stated on the drawings, as follows:

(a) 3 mm for "nominal" dimensions up to and including 76 mm;

(b) 5 mm for "nominal" dimensions over 76 mm.

The above will be the nett allowances permitted off the "nominal" dimensions specified or stated on the drawings and will not be additional to the tolerances specified for sawn timbers.

All exposed angles of wrought woodwork, unless otherwise specified, shall be arris rounded. The term "arris rounded" denotes that the angles shall be rounded off to approximately 3 mm radius.

Angles of wrought woodwork specified to be angle rounded shall be rounded off to 6 mm radius, unless otherwise shown on the drawings, and shall include, in framed joinery, for housed and mitred joints.

PB 5.5.3 Lengths Of Timbers and Methods of Jointing

Plates, purlins, battens, laths, slats, etc., shall be in single lengths, but where this is not possible the end joints will be formed as described below. The jointing of plates, battens, etc. at junctions and angles shall also be formed as stated hereunder, viz:

(a) Wall plates shall be halved at joints and well spiked together, and also at junctions and angles;

(b) Purlins shall be splayed or spliced at joints and, unless otherwise specified, using timber side plates of the same dimensions as purlins, not less than 600 mm long and four times bolted with M1O mild steel bolts, with two washers each. Adjacent purlins shall not be splayed or spliced in the same bay or on the same rafter;

(c) Sawn battens, laths, slats, etc„ shall be butt jointed at heading joints and

angles, and wrought battens, laths, slats, etc., shall be splayed at heading joints and mitred at angles, all over points of support and where adjacent, shall not be jointed on the same rafter.

PB 5.5.4 **Joints In Roof Trusses**

(a) The number of connecting devices to be used at each intersection between two members at any heel joint or any splice in a truss shall be determined from the following table:

SPAN m	3 (90 x mm) NAILS PLUS M10 BOLTS AS SPECIFIED BELOW	M16 BOLTS ONLY	50 mm TOOTHED RING CONNECTIONS
3	2	2	1
4	3	2	1
5	3	2	2
6	4	3	2
7	5	3	2
8	5	3	2
9	6	4	3
10	6	4	3

(b) In the case of any joint other than a heel joint or splice, one M10 bolt plus three 90 x 4 mm nails shall be used.

PB 5.5.5 **Prefabricated Roof Trusses**

Prefabricated timber roof trusses shall be constructed of South African pine as described in clause

3.17 to the designs shown on the detail drawings. The timber shall be of cross-sectional dimensions shown, cut to correct lengths with ends square or cut to the required angle, and shall be assembled in truss fabricating jigs with the truss having the proper camber, and tightly clamped together and joints secured with approved connector plates of galvanised steel sheet, pressed into the timber simultaneously on both sides of the truss with hydraulic press capable of exerting such pressure as will ensure complete penetration of the teeth into the timber. The connector plates shall be of such size as will ensure that the joints so made will adequately withstand the forces exerted on the points, and to have at least two coats Epoxy Tar finish for coastal areas.

PB 5.5.7 **Purlins**

Unless otherwise specified, purlins shall be 50 mm x 76 mm and shall be securely nailed to roof timbers at not exceeding 1,14 m centres, ranging perfectly straight and square to the roof with but joints at heading joints and angles and in the case of wrought purlins splayed joints at heading joints and mitred joints at angles.

PB 5.5.8 **Brandering To Ceilings**

The brandering shall be 38 mm x 38 mm, securely spiked up to the supporting timbers with 88 mm wire nails at 380 mm centre-to-centre. Cross brandering shall be cut in between the longitudinal brandering and securely skew nailed to same with 75 mm wire nails at joints in ceilings and at edges where required for fixing of cornices.

PB 5.5.9 **Steel Roofing Sheets**

The sheets shall be secured to wood purlins with approved galvanised iron roofing screws each provided with a plastic or asphalt felt washer and a galvanised steel cup washer over the plastic or felt washer and secured to steel purlins with M6 galvanised hook bolts, provided with similar washers under nut.

Screws and bolts at ends of sheets and at end laps shall be spaced at not exceeding two corrugations apart wherever possible, but in no case more than three corrugations apart, and at intermediate purlins at not more than four corrugations apart; screws or bolts shall, in all cases, be provided in the outermost corrugations of the upper sheets.

All necessary cutting to sheets shall be properly performed. Cut edges at sides of valleys, and elsewhere exposed, shall be perfectly straight.

At exposed verges of roofs the iron shall be finished with neatly formed rolls.

The sheets shall have side laps of not less than one and a half corrugations. The minimum roof slopes and sheet end laps shall be, unless otherwise specified, as prescribed in Table 2 of Schedule 2 of Part L of the National Building Regulations and Building Standards Act, 977.

PB 5.5.10 **Metal Ridging Por Steel Covered Roofs**

The ridging shall be 450 mm girth with roll top and bent down edges, and shall be lapped 225 mm at end joints, cut and properly lapped and fitted at intersections of ridges, hips and valleys, and close beaten into corrugations of roofing iron. Roll shall be closed at feet of hips and at end of ridging.

Ridging shall be fixed with screws to wood purlins and hook bolts to steel purlins, with washers under heads and nuts, respectively, at! as described for fixing roofing sheets, and spaced at not exceeding 300 mm centres.

PB 5.5.11 **Fibre Cement Roofing Sheets**

The sheets shall be mitre-cut at corners as necessary and laid with smooth surface on top, and shall be secured to wood purlins with 7 mm diameter galvanised drive screws not less than 114 mm long, and to steel purlins with M8 galvanised hook bolts, each provided with a plastic or asphalt felt washer and a galvanised steel cupped washer over the plastic or felt washer.

Screw and bolt holes in sheets shall be drilled (not punched) and shall be 0,2 mm larger than the diameter of screws and bolts.

The fixing screws, and nuts on fixing bolts, shall not be tightened more than is necessary for the holding down of the sheets and for the proper seating of the washer over the corrugations, so as to allow for slight movement between the sheets and the supporting structure. On no account shall sheets be deflected at the intermediate purlins in an attempt to make the sheets bear on such purlins.

The side laps of sheets shall be sheltered from the prevailing wind by laying the sheets from left to right, or from right to left, depending on the direction of the prevailing wind, the sheets being laid in the opposite direction to that of the wind.

All necessary cutting to sheets shall be properly performed. Cut edges at sides of valleys, and elsewhere where exposed, shall be perfectly straight.

The minimum roof slopes and sheet end laps shall be, unless otherwise specified, as prescribed in Table 1 of Schedule 2 of Part L of the National Building Regulations and Building Standards Act, 1977.

The manufacturer's instructions regarding laying and fixing of sheets, including side laps, mitring of corners and spacing of screws or bolts, shall be followed in all cases.

One month after fixing, the roof covering shall be thoroughly examined, any defects made good and loose screws or bolts tightened.

Roof boards shall be used by all workmen for safety and to avoid damage to the sheeting

PB 5.5.12 **Adjustable Fibre Cement Ridging**

The ridging shall be secured to wood purlins with screws and to steel purlins with hook bolts, passed through the roofing sheets, and provided with plastic or felt and steel washers, all as described for fixing fibre cement roofing sheets.

The manufacturer's instructions regarding laying and fixing of the ridging, including spacing of screws or bolts, shall be followed in all cases.

PB 5.5.13 **Fascias And Barge Boards**

Fascias and barge boards of pressed fibre cement boards shall be butt jointed with 75 mm wide x 3 mm thick galvanised steel plates four times bolted with M6 galvanised bolts over joints.

PB 5.5.14 **Fibre Cement Flashings**

Fibre cement flashings shall be secured to wood purlins with screws and to steel purlins with hook bolts, passed through the roofing sheets, and provided with plastic or felt and galvanised steel cupped washers, alt as described for fixing fibre cement roofing sheets.

The manufacturer's instructions regarding fixing of the flashings, including spacing of screws or bolts shall be strictly adhered to.

PB 5.5.15 **Fibre Cement Gutters**

Fibre cement gutters shall be bedded in approved bituminous mastic compound and secured with M6 galvanised gutter bolts with heads of bolts on inside of gutters and each bolt provided with asphaltic felt and galvanised steel washer under head and nut, all in accordance with the manufacturer's instructions. The inside surfaces of sockets and the outside surfaces of spigot ends shall be coated with a thin solution of bitumen to enable the compound to adhere fast when applied, and surfaces of washers in contact with each other and with gutters hall be coated with bitumen. After tightening the bolts, all surplus compounds from the joints shall be removed, and the joints externally finished with neatly trowelled fillets of 2:1 cement mortar.

The spigot ends of gutters shall be lapped on to the socket ends in the direction of the flow wherever possible.

The gutters shall be fixed with proper falls on gutter brackets of the fascia type where fixed to fascia boards and of the purlin type where fixed to purlins. Brackets shall be securely screwed to the roof timbers, at not exceeding 1 m centres, and with extra brackets at angles and outlets.

Gutters shall be provided with all necessary angles, stopped ends, outlet nozzles, etc., jointed to gutters as described above.

PB 5.5.16 **Fibre Cement Rainwater Down Pipes**

Fibre cement rainwater downpipes shall be jointed with tarred hemp rope gasket baulked into each joint, and the joint filled with a suitable bitumen compound and finished off with neatly trowelled fillet of 2:1 cement mortar.

The pipes shall be fixed to walls with holderbats, bolted around pipes immediately below the socket, and with tails builds into walls in 3:1 cement mortar.

Rainwater downpipes shall be provided with all necessary swan necks, branch pieces, plinth bends, radius bends, shoes, etc., jointed to pipes as described above.

PB 5.5.17 **Concrete Roofing Tiles**

Tiling shall be "straight or broken bond", and vertical joints between t1les and bottom edge of each course of tiles shall range perfectly straight. Unless otherwise specified, interlocking tiles shall be laid to a lap of at least 100 mm and plain tiles to a lap of at least 62 mm.

Half tiles in the case of interlocking tiles, and tile and a half in the case of plain tiles, shall be provided as required at abutments and at verges of roofs. Plain tile roofs shall be provided with double course at eaves.

Unless otherwise specified, each tile in every third course in the case of interlocking tiles, and in every fifth course in the case of plain tiles; all tiles in eaves courses and ridge courses; end tiles in every course at each side of hips and valleys; all tiles adjoining bonnet hip tiles in plain tile roofs; half tiles, full tiles and tile and a half at verges, and all tiles to open eaves and open overhanging verges, shall be fixed to the battens with galvanised nails of such length as will penetrate the battens to a depth of at least 25 mm.

Tiling shall be carefully cut and dressed at hips and valleys and, where necessary at abutments, etc. Mitred portions of tiles at hips and valleys shall be holed and properly secured

Hop and ridge tiles for interlocking tile roofs shall be rocketed V-type, shall match general tiling, and shall be bedded solid in 3:1 cement mortar with strip of approved bituminous sheeting laid under the mortar bedding, of such width as will give a lap of at least 25 mm on to the roof tiling at each side, and lapped not less than 75 mm at end joints. Socketed joints of hip and ridge tiles shall be bedded in mortar as above and pointed with neatly recessed joints, and hip iron of 25 mm x 4,5 mm mild steel 300 mm long, suitably bent, twice holed and securely nailed to hip rafter, shall be provided at foot of each hip. The mortar bedding shall be trowelled smooth at open ends of ridges.

Ridge tiles for plain tile roofs shall be as above but half-round and but jointed and neatly

pointed in tinted 3:1 cement mortar, and hip tiles shall be round pattern bonnet type, to course and bond in with general tiling, and with each tile bedded and neatly pointed in mortar as above and nailed to hip rafter with galvanised nail.

Hip and ridge tiles shall be neatly cut and fitted together at junctions between ridges and hips or valleys, and shall be bedded solid and neatly pointed in tinted 3:1 cement mortar with approved bituminous sheeting under the mortar bedding, cut to shape required and with lap of 25 mm on to the roof tiling.

PB 5.5.18 **Covering To Ceilings**

(a) Gypsum plasterboard ceilings with plaster finish

The ceiling boards shall be in 900 mm or 1 200 m widths, with board at ends of ceilings of widths required to suit length of ceilings. Ceiling board shall be in single lengths to the width of ceilings wherever possible.

The boarding shall be nailed to the brandering, with GREY surface to underside, with 2 mm diameter galvanised or cadmium plated clout headed nails, 38 mm long, spaced at not more than 100 mm apart at edges of boards and 150 mm apart along the intermediate brandering.

The joints between boards shall be loose butt joints and covered with wire gauze strips nailed through the boarding to the brandering at 400 mm centres with 38 mm galvanised clout headed nails.

The bonding plaster shall be applied in two layers by the trowel-float-method to a total thickness of not less than 6 mm, and well pressed into the wire scrim over the joints between the ceiling boards, and finished smooth, even and true.

(b) Fibre cellulose board ceilings

The ceiling boards shall be in the same widths, and fixed as specified for gypsum plasterboard ceilings in paragraph (a).

The joints between the boards shall be covered with 25 mm half-round wood cover beads fixed with 38 mm long nails spaced at not exceeding 300 mm.

PB 5.5.19 **Cove Cornices to Ceilings**

(a) Gypsum plasterboard cornices

Cove gypsum plasterboard cornices shall be nailed through the ceiling boards to the brandering and to wall plugs, at not exceeding 200 mm centres, with 2 mm diameter galvanised or cadmium plated clout headed nails, 38 mm long, or fixed to walls with hardened steel nails driven into the brickwork.

Cornices shall be scribed at internal angles and mitred at external angles and shall be in long lengths with splayed heading joints where necessary.

(b) Timber cornices

Scotia's shall be fixed to walls with hardened steel nails driven into the brickwork.

PB 5.5.20 **Trapdoors In Ceilings**

Openings for trapdoors in ceilings shall be formed with 38 mm x 38 mm brandering all around each opening, spiked together and to bottom edge of the supporting timbers. Size of opening, unless otherwise specified, shall be 650 mm x 650 mm.

Trapdoor shall be formed with skeleton frame of 50 mm x 38 mm brandering, covered on underside with boarding as for ceiling, and hung on a pair of 75 mm steel butts and fitted on underside near closing edge with 100 mm brass bow handle. Soffit of trapdoor shall be flush with soffit of ceiling when closed, and trapdoor shall flap back on to top of the brandering, between tie beams or ceiling joists when open.

When trapdoor is closed it shall rest on 50 mm x 19 mm fillets, fixed on soffit of ceiling all around opening, mitred at angles and securely screwed up to the trimmers. Fillets shall project 12 mm into the opening to carry the trapdoor.

Trapdoors larger than 650 mm x 650 mm shall each be provided with 38 mm x 38 mm brandering across centre, spiked to the skeleton frame.

PB 5.5.21 **Ceiling Insulation**

Ceilings shall be insulated, where so specified, with approved resin bonded or stitched fibre glass or mineral wool insulation blanket 38 mm thick, cut to size and laid over brandering between ceiling joists and tie beams, etc.

Where insulation is to be in two thicknesses a total thickness of 76 mm is required and the joints shall be staggered

PB 5.5.22 **Framed Joinery**

Where the word "Framed" is used it is to include for all mortice and tenon joints, dovetail joints, grooves, stop grooves, rebates, stop rebates, housings, notchings, etc., including housing ends of shelves, divisions, etc.

PB 5.5.23 **Joinery**

Joinery work shall be put in hand immediately after the order has been given to commence work, or after the receipt of detail, where such are to be supplied, and shall not be wedged or glued up until just before fixing in the building.

No framed joinery for services situated inland shall be manufactured in the humid coastal belt, and no framed joinery for the services situated in the coastal belt shall be manufactured inland. This applies to both purpose made and stock joinery.

All exposed softwood timber in joinery which is not to be painted shall be free from large, loose or dead knots, knot holes, checks, splints, wane or other defects, and in joinery which is to be painted shall be free from all defects other than those which can be filled or otherwise made good in such a way as will not impair the paint finish. All exposed hardwood joinery timber shall be free from all knots, knot holes, checks, splints or other defects and, unless otherwise specified, shall also be free of sapwood.

Purpose made joinery shall be manufactured strictly in accordance with detail drawings.

Stock joinery shall be of approved quality. Joinery shall not be primed until it has been inspected and approved.

Skirting, rails and the like shall be in long lengths. Heading joints where necessary shall

be splayed. Counter tops, table tops, drainers, and the like, shall be formed with wide boards, jointed with grooved, cross-tongued and glued joints or with grooved rebated and glued joints of approved type; cross-tongues shall be stopped 25 mm back from ends where ends are exposed to view. The boards shall be in single lengths to top, etc., but where this is not possible the heading joints shall be staggered and jointed as above.

Skirting, rails, angle moulds and beadings of all kinds, shall be close fitted, mitred or scribed at angles, and securely fixed; skirtings, rails and the like shall be fixed with hardened steel or other suitable nails driven into the brickwork or shall be nailed to wall plugs spaced at not more than 700 mm apart. Glazing beads and the like shall be mitred at angles and, unless otherwise specified, shall be fixed with panel pins.

PB 5.6 **METALWORK**

PB 5.6.1 Manufactured Steelwork Generally

Welding is to be done electrically \n the most up to date manner by skilled workmen and cleaned off on completion.

All welds are to be welded with welding rods of the same chemical composition as the tubes, rods, bars, etc., to be welded and all external welds are to be filed clean and smooth.

Welding to be continuous fillet welding to all exposed edges unless otherwise described.

No scaffolding shall be allowed *to* rest on or fixed to steel windows, doors, frames, etc., in any way.

PB 5.7 **RESILIENT FLOOR FINISHINGS**

PB 5.7.1 Laying And Fixing

Vinyl sheeting and tiles and such like floor finishing's shall be laid in strict accordance with the manufacturer's instructions, on a perfectly dry and clean screeded surface, using an adhesive supplied or recommended by the manufacturer of the flooring material, and rolled with a suitable roller to ensure complete adhesion of the material. The flooring shall be cut where required and neatly fitted against adjoining floors, thresholds, etc. Vinyl skirtings shall be close fitted to floors and walls, butted at end joints, neatly mitred at internal angles and dressed round external angles, and fixed with adhesive as for flooring.

Unless otherwise described, sheet flooring shall be in standard widths with cut sheets at sides of floors as necessary.

PB 5.8 **GLAZIER**

PB 5.8.1 Fixing Of Glass

Glass fixed with glazing beads in unpainted hardwood doors shall be bedded on strips of rubber, velvet, leather, or felt turned over on to both sides of glass in the rebates to form a soft packing between the glass and the woodwork. In all other cases the glass shall be well bedded in back putty in the rebates.

Glass rebates, other than in unpainted hardwood doors, shall be primed before glazing.

Glass panes exceeding 0,5 m^2 in surface area and fixed with putty only in wood doors, sashes and the line shall be secured in addition with glazing sprigs, and in steel windows and doors with glazing pegs or clips inserted in holes in the steel framing.

Glass panes shall have adequate clearance between the edges of glass and the rebates.

Putty shall be carefully trimmed and cleaned off with front putty worked to within 3 mm of the sight lines.

PB 5.9 **PAINTER**

PB 5.9.1 Preparatory Work

(a) General

All floors must be swept clean and walls dusted down, and surfaces not being painted such as face brickwork, sills, floors and stained woodwork covered up and protected against spotting, before any painting is commenced.

No sweeping or dusting shall be done whilst painting Is in progress or whilst paint is still wet.

(b) On woodwork

Woodwork being painted shall be well brushed down, knots treated with knotting, and all surfaces primed, stopped with hard stopping and rubbed down to an even surface ready to receive the paint.

Woodwork being oiled or stained shall have all plaster stains, pencil marks and other surface discolorations and blemishes carefully removed, and stopped with tinted stopping and well rubbed down.

(c) On metalwork

All metal surfaces being painted, except steel structures shall be cleaned of all rust, scale and dirt by scraping or by means of steel wire brushes; also all oil and grease shall be removed and a perfectly clean surface obtained. If necessary the surface shall be decreased immediately before applying the priming coat, by the use of a suitable grease- removing solvent; any salt deposits on the metal surfaces as may occur in industrial and marine atmospheres shall be removed by the use of a suitable detergent and the surface then thoroughly rinsed and allowed to dry.

New galvanised metal surfaces and surfaces of all non-ferrous metals, which are to be painted, shall be cleaned down as above and given one coat of wash primer (metal etch primer).

Protective coatings on new galvanised metal surfaces, applied by the manufacturers to prevent storage stain and white rust, shall be completely removed by the use of a suitable cleaning agent and the surfaces thoroughly rinsed and allowed to dry, before the surfaces are primed or painted.

After cleaning off rust on metalwork those portions so affected shall be

treated with an approved rust inhibitor.

(d) On plaster
All plastered wall, ceiling and such like surfaces being painted or distempered shall be filled where necessary with suitable stopping or patching plaster and the whole rubbed down ready to receive the finishing.

(e) On ceilings

Boarded ceilings, cover strips and cornices being painted or distempered, shall be filled where necessary with suitable stopping and all nail heads in ceilings, cover strips and cornices being distempered shall be primed with flat paint.

(f) On block work
All block work shall be cleaned down to remove all loose and dusty matter, prior to being heated with finishing.

PB 5.9.2 **Surfaces To Be Dry**

All plastered wall, ceiling and similar surfaces shall be perfectly dry and in a fit state to receive the finishing, before the work is put in hand.

PB 5.9.3 **Priming**

Wood, metal and other surfaces normally primed before being painted shall be prepared and primed as before described in readiness to receive the specified paint system.

Backs of wood door and similar frames and surfaces of other new or re-fixed joinery in contact with brickwork, etc., and built in as the work proceeds, shall be primed before building in whether the articles are to be painted or not, to prevent moisture seeping into the wood from the mortar bedding

Wood surfaces shall be knotted, primed and stopped before being coated with emulsion paint or

distemper.

Tongued and grooved and rebated edges of boards in batten doors, and other suchlike inaccessible parts of joinery shall, before the joinery is assembled, be primed or where the joinery is to receive a finish other than paint, be given one coat of such other finishing material.

Priming to external structural timbers shall be applied before the timbers are fixed in position and shall include all wrought surfaces, such as backs of fascia and barge boards.

PB 5.9.4 **Application of Paint**

All coats of paint shall be thoroughly dry before subsequent coats are applied and rubbed down where necessary.

Alt work shall be finished to colour approved by the Engineer. The tints of undercoats shall approximate those of the finishing colour and in order to indicate the number of coats applied and to avoid misses when applying a succeeding coat, a slight difference shall be made in tint of each coat.

Priming on wood surfaces shall be by brush application. Priming on surfaces other than wood shall be by brush application or if in the opinion of the Engineer, the primer and the surfaces are considered suitable for roller application, the primer may be so applied. Priming applied by brush application shall be well brushed in to obtain maximum penetration.

Undercoat and finishing coats may be applied by brush or roller.

The use of spray gun on site for application of paint will not be permitted, except in the case of cellulose and other special cases where spraying is the accepted method of application; in cases where spraying is permitted all surrounding surfaces shall be properly masked,

The finishing coat on woodworm and metalwork, unless otherwise specified, shall be of high gloss paint. All materials shall be used in strict accordance with the manufacturer's instructions.

PB 5.10 **PROTECTION AND CLEANING OF WORKS**

The Contractor shall provide all necessary dust sheets, covers, etc., and shall exercise all necessary care to prevent marking surfaces of walls, floors, ceilings, glass, electrical fittings, etc., and shall keep all parts of the works perfectly clean and free at all times from spotting, accumulation of rubbish, debris or dirt arising from the operations. Any surface disfigured or otherwise damaged shall be completely renovated or replaced as necessary, to the Engineer's approval, by the Contractor at his own expense.

The premises shall be left clean and fit for occupation at the completion of the work.

PB.5.11 **PLUMBING AND DRAINAGE**

SUPPLEMENTARY PREAMBLES

PB.5.11.1 **"Polycop" polypropylene pipes**

Polypropylene pipes 54mm diameter and under shall be seamless copper coloured class 16 pipes with "Fast-fuse" heat welded thermoplastic or brass compression fittings as designed for use with copper pipes as stated

Pipes shall be firmly fixed to walls etc. with coloured nylon snap-in pipe clips with provision for accommodating thermal movement and jointed and fixed strictly in accordance with the manufacturer's instructions

All pipes diameters are nominal external

PB.5.11.2 **"Polyink" polypropylene pipes**

Polypropylene pipes 63mm diameter and over shall be class 12 pipes jointed with cast iron "Supaclamp" running joints

Fusion welded bends, once or twice mitred as necessary, and tees shall be factory manufactured. Fusion welded bends and tees shall include jointing to pipes with PVC rubber ring double Z joint couplers.

Branch tees shall include flanged and bolted joints to "Polycop" branch pipes in addition and for brass compression male iron to copper straight couplers.

Reducers shall be including jointing to pipes with PVC rubber ring Z joint couplers and reducers shall be of sufficient overall length to accommodate same.

All pipes shall be jointed and fixed strictly in accordance with the manufacturer's instructions. All pipe diameters are nominal external.

PB.5.11.3 **uPVC pipes and fittings**

Sewer and drainage pipes and fittings shall be jointed and sealed with butyl rubber rings.

Soil, waste and vent pipes and fittings shall be solvent weld jointed uPVC pressure pipes and fittings.

Pipes for water supply shall be of the class stated.

Pipes of 40mm diameter and smaller shall be plain ended with solvent welded uPVC loose sockets and fittings

Pipes of 50mm diameter and greater shall have sockets and spigots with push-in type integral rubber ring joints. Bends shall be uPVC and all other fittings shall be cast iron, all with similar push- in type joints.

PB.5.11.4 **Copper pipes**

Pipes shall be hard drawn and half-hard pipes of the class stated. Class 0 (thin walled hard drawn) pipes shall not be bent. Class 1 (thin walled half-hard), class 2 (half-hard) and class 3 (heavy walled half-hard) pipes shall only be bent with benders with inner and outer formers. Fittings to copper waste, vent and anti-syphon pipes, capillary solder fittings and compression fittings shall be "Cobra Watertech" type. Capillary solder fittings shall comply with ISO2016. Only compression fittings shall be used in walls and ground.

All soldered joints shall be wiped and brass unions shall be used for jointing lead to steel.

PB.5.11.5 **Reducing fittings**

Where fittings have reducing ends or branches they are described as "reducing". In the case of pipes with diameters not exceeding 60mm only the largest end or branch size is given. Should the contractor wish to use other fittings and bushes or reducers he may do so on the understanding that no claim in this regard will be entertained. In the case of pipes with diameters exceeding 60mm all sizes are given and no claim for extra bushes, reducers, etc. will be entertained.

PB.5.11.6 **Wire gratings**

Descriptions of gutter outlets etc. shall be deemed to include wire balloon gradings.

PB.5.11.7 **Exposed concrete surfaces**

Exposed surfaces of concrete storm-water channels, cover slabs, inspection eye markers slabs, gully tops, cleaning eye tops, catch pits, inspection chambers, etc. shall be finished smooth with plaster,

PB. 5.11 8 **Excavations**

No claim for rock excavation will be entertained unless the contractor has timeously notified the principal agent thereof prior to backfilling.

"Soft rock" and "Hard rock" shall be as defined in "Earthworks"

PB.5.11.9 **Laying, backfilling, bedding, etc. of pipes**

Pipes shall be laid and bedding and trenches shall be carefully back filled in accordance with manufacturers instruction

Where no manufacturers' instructions exist pipes shall be laid in accordance with clauses 5.1 and 5.2 of each of the following: SABS 1200 L: medium-pressure pipelines LD: Sewers LE. Storm- water drainage pipe trenches etc. shall be backfilled in accordance with clauses 3, 5.5, 5.6, 5.7 and 7 of SABS 1200 DB. Earthworks (Pipe trenches) Pipes shall be bedded in accordance with clauses 3.1 to 3.4.1, 5. to 5.3 and 7 of SABS 1200 LB: Bedding (Pipes). Unless otherwise described bedding of rigid pipes shall be class B bedding.

PB.5.11.10 **Stainless steel basins, sinks, wash troughs, urinals, etc**.

Units shall have standard aprons on all exposed edges and tiling keys against walls where applicable.

PB.5.11.11 **Waste unions**

Descriptions of waste unions shall be deemed to include rubber or vulcanite plugs and claims fixed to fittings.

PB 6 **TOLERANCES**

PB 6.1 **BASIS OF MEASUREMENT**

PB 6.1.1 General

Permissible deviations will apply in the case of linear dimensions, position, and level. The Contractor shall construct each of the various parts of the works within the limits of the applicable permissible deviations set out in clause 6.2 unless some other degree of accuracy is required in terms of the project specification or is shown on the drawings.

PB 6.1.2 Methods Of Measurement of Deviations

Certain deviations will be measured as set out below:

(a) Any deviation from flatness of a plane surface, will be measured as the maximum deviation of the surface from any straight line of length 3 m joining two points on the surface, determined by means of a straight edge the ends of which are supported on identical blocks of suitable thickness placed one over each of the points.

(b) Any abrupt change in a continuous surface, including a local depression or peak in a floor or wall, will be measured as specified in (a) above.

Out-of-squareness of a corner or an opening or an element such as a column will be measured by taking the longer of two adjacent sides as the base line, and determining any departure from the perpendicular of the side at either end of this base line.

PB 6.2 **PERMISSIBLE DEVIATIONS**

The permissible deviations for elements or components shall be as follows:

(a) Position on plan of any edge or surface measured from the nearest grid line or agreed centre line +/-25 mm

(b) Linear (other than cross-section) dimensions 30 mm

(c) Cross-section dimensions -10+ 20 mm

(d) Level (deviation from designed level with reference to the nearest transferred datum (TD) of the upper or lower surface, as may be specified, of any slab or other element or component) +/- 10 mm

(e) Out-of-squareness of a corner or an opening or an element such as a column (See clause 6.1.2(c)) for short side of length:

(i) up to and including 0,5 m

(ii) over 0,5 m up to and including 2 m

(iii) over 2 m up to and including 4 m ...

(f) Exposed surface (including floor slabs and paving).

(i) Flatness of plane surface +/-5m

(ii) Abrupt changes in a continuous surface +/-5mm

(g) Exposed surface to be plastered or receive normal or granolithic screeds:

(i) Flatness of plane surface +/-10mm

(ii) Abrupt changes in a continuous surface +/-5mm

(h) Surface of plaster and normal or granolithic screeds +/-5mm

PB7 **TESTS**

PB7.1 **GENERAL**

The Engineer shall have free access to the works for taking samples and carrying out tests. The Contractor shall render any assistance necessary. If so required, the Contractor shall provide storage and protection of such samples on site

PB 8 **MEASUREMENT AND PAYMENT**

PB 8.1 **GENERAL**

PB 8.1.1 All items in this section will be measured by number, square metre or linear metre completed and the tendered rates shall include full compensation for the supply, delivery, handling and installation of all materials, the provision of all necessary labour and supervision, transport, plant, equipment and incidentals necessary to complete, protect and maintain the works as specified or as shown on the drawings.

PB 8.1.2 Where a lump sum is required for a complete structure, the tendered rate shall include all items and contingencies, as specified in this section or as shown on the drawings.

PB 8.2 **SCHEDULED ITEMS**

Brickwork.....Unit : m

Brickwork will be measured on the centre line of the walls. Areas occupied in walls by windows and doors will be excluded from the areas measured, and corners and intersections common to more than one brick wall will be measured once only.

The rate shall cover the cost of brickwork complete as specified, including test sections where specified, pointing, providing brick lintels, brick reinforcement and ties, etc., the building in of conduits, beams, pipe sleeves, doors and windows, the raking out of joints and the filling of cavities in cavity walls and walls constructed of hollow concrete masonry units, below floor level and elsewhere where specified.

The test section for faced brickwork as specified in clause 5.1.14 shall only be paid for if approved by the Engineer and, if rejected, shall be removed at the Contractor's expense.

PB 8.2.2 **Air Bricks**

(a) External air bricks ..... Unit : No
(b) Internal air bricks ..... Unit : No

The rate shall cover the cost of providing and building in the air bricks as specified.

PB 8.2.3 **Bagged Finish to Brickwork** ..... Unit : m^2

The rate shall cover the cost of providing rough sacking, additional cement grout as required and finishing the bagging as specified.

PB 8.2.4 **Window Sills**

(a) External (describe) ..... Unit : m

(b) Internal (describe) ..... Unit : m

The rate shall cover the cost of providing and building in face bricks, fibre cement sheets or any other material prescribed, as well as all accessories specified.

PB 8.2.5 **Tiling** ..... Unit : m^2

The rate shall cover the cost of providing all material and the laying and grouting of tiles, complete as specified

PB 8.2.6 **Plaster Work** ..... Unit : m^2

The rate shall cover the cost of the construction of the plaster work, including the supply of all materials, mixing, applying, finishing, forming reveals, joints, etc., complete *as* specified.

PB 8.2.7 **Floor Screeds**

(a) Normal screeds ..... Unit : m^2
(b) Granolithic screeds ..... Unit : m^2

The rate shall cover the cost of the construction of the floor screeds, including the supply of all materials, mixing, laying, finishing, the forming of nosings, reedings, skirtings, etc. and, where the concrete sub-floor has matured, of the brushing and applying a cement grout, complete as specified.

PB 8.2.8 **Paving** ..... Unit : m^2

The rate shall cover the cost of providing paving slabs or bricks, sand bedding and joint filling and expansion joint material and of constructing the paving.

PB 8.2.9 **Waterproofing**

(a) Damp-proof course in walls ..... Unit: m

(b) Damp-proof membrane under floors ..... Unit: m^2

The unit shall be the net length or area of waterproofing installed. The length or area of overlaps shall not be measured for payment.

The rate shall cover the cost of providing and laying all material as specified, including

the sealing of all laps and joints, complete as specified.

PB 8.2.22 **Expansion Joints** ..... Unit : m

The rate shall cover the cost of providing and installing all filling and sealing material and of the forming of expansion joints, complete as specified

PB 8.2.11 **Structural Timber**

(a) Wall plates (indicate size) ..... Unit: m

(b) Beams (indicate size) ..... Unit : m

(c) Joists (indicate Size) ..... Unit : m

(d) Rafters (indicate size) ..... Unit : m

(e) Purlins (indicate size) ..... Unit : m

(f) Brandering (indicate size) ..... Unit : m

(g) Roof trusses complete (indicate drawing number) ..... Unit : No

(h) Roof complete (indicate drawing number) ..... Unit: Sum

The rate shall cover the cost of the supply of all materials, manufacture, cutting, waste, laps, joints and fixing of the timber as indicated, including nails, bolts, nuts, washers, hoop irons, ties and other fixtures required, complete as specified.

PB 8.2.12 **Roof Covering** ..... Unit : m

The rate shall cover the cost of providing and fixing all roof covering material as prescribed, including all flashings, soakers, valleys, ridge coverings, roofing screws and all other fixtures required to complete the work, as specified.

PB 8.2.13 **Fascias and Barge Boards** ..... Unit : m

The rate shall cover the cost of providing and fixing of all material, fixtures, screws, bolts, nuts, washers and other accessories required to complete the work, as specified.

PB 8.2.14 **Gutters And Rainwater Down pipes**

(a) Gutters ..... Unit m

(b) Rainwater downpipes ..... Unit . No

The rate shall cover the cost of supply and building in of all material including angles, stopped ends, outlet nozzles, gutters, gutter brackets, etc. for gutters and swan necks, branch pieces, plinth bends, radius bends, shoes, brackets, etc. for rainwater downpipes, including all bolts and sealants, complete as specified.

PB 8.2.15 **Ceilings**

(a) Ceilings ..... Unit : m

(b) Cornices to ceilings ..... Unit : m

The rate shall cover the cost of supply and installation of all material including cover strips to joints, nails, trapdoors and gypsum plaster where prescribed, complete as specified.

PB 8.2.16 **Ceiling Insulation** ..... Unit : m

The rate shall cover the cost of supply and installation of all material, as specified.

PB 8.2.17 **Joinery**

(a) Doors (type and size indicated) ..... Unit : No

(b) Skirtings *(size* indicated) ..... Unit . m

(c) Other items (describe or indicate drawing number) ..... Unit No or m

The rate shall cover the cost of the supply of all material, manufacture, cutting, waste, fixing and installation of the joinery items, complete as specified.

The rate for doors shall also cover the cost of the door frames and all accessories, such as hinges, hooks, bolts, locks, latches, etc., and of damp-proof course on both sides and above door frames in cavity walls, as specified.

PB 8.2.18 **Metalwork** ..... Unit : No

The rate shall cover the cost of supplying all material, manufacture, applying priming coat of paint or galvanising, as specified, delivery and building in of units, including burglar proofing where specified, locks, catches, glazing, etc., and of damp-proof course under all windows and on both sides and above frames in cavity walls, as specified.

PB 8.2 19 **Resilient Floor Finishing**

(a) Vinyl-fibre, PVC, or thermoplastic floor tiles (specify) ..... Unit : m^2

(b) Vinyl cove skirting ..... Unit : m

The rate shall cover the cost of supplying all material and adhesives required and the laying of the floor finishing's.

PB 8.2.20 **Painting** ..... Unit: m^2 or Sum

Only the surface covered by the final finishing coat shall be measured

The rate shall cover the cost of surface preparation, supplying and applying all the coats of paint, repairing any damaged surfaces, and all materials necessary for completing the work.

PB 8.2.21 **Electrical Installation** ..... Unit: m^2 or Sum

The rate shall cover the cost of supplying and building in of all equipment such as switchboards, conduits, wires, cables, sockets, light fittings, etc., cutting recesses, chases and holes in walls as required and repairing any damaged surfaces after installation, including testing of the installation.

PB 8.2.22 **Miscellaneous** ..... Unit : No, Sum or m

The rate shall cover the cost of all workshop detail drawings, where prescribed, material, plant, tools and labour to complete the scheduled items complete, as detailed, including corrosion protection and/or painting, as specified, and building in.

C3.3.2 SPECIFICATION FOR MECHANICAL WORKS

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NOT APPLICABLE,

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SABS 0298: 1999 - Code of Practice: Indirect small to medium-sized gas chlorination systems for the disinfection of water.

C3.3.2.3 PARTICULAR/GENERIC SPECIFICATIONS

For the purpose of this Contract, the following Particular and Generic Specifications shall apply:

PMA Mechanical and Electrical Installations

The particular specifications referred to above have been written to cover all phases of work usually encountered in contracts of this nature and may therefore cover items of work not encountered in this particular contract. In case of any discrepancy or conflict with any part of the particular specification, the requirements of "C3.2: Engineering" shall apply.

C3.3.2.4 PLANT AND MATERIALS

C3.3.2.5 MATERIALS, SAMPLES AND SHOP DRAWINGS

This section shall be governed by the requirements of the Conditions of Contract as defined and amended in “Part C1: Agreement and Contract Data

PSMB: **CHEMICAL DOSING EQUIPMENT (SECTION B)**

PSMB.1 **SCOPE**

This section of the Contract covers the supply delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order and upholding during the Defects Liability Period of:

a) TWO flocculant storage tanks.
b) TWO chemical dosing pumps for flocculant.
c) All interconnecting pipework and valves.
d) Supply of 10 000 flocculant litres in bulk.

PSMB. 2 **FLOCCULANT DOSING PLANT**

The Flocculant dosing plant shall be installed in a suitable new structure, which shall be constructed by others. The Contractor under this section of the contract shall give full details of his equipment, including a schematic layout thereof.

The system shall dose a maximum of 10 l/hr flocculant automatically (Auto on/off to a weir in the dosing channel, all as shown on the drawings. The quantity of solution shall be added accurately by means of a positive displacement chemical metering pump which will be manually adjustable.

The flocculant will be supplied in liquid form. Two new tanks shall be provided for the storage of the flocculant. New pipework shall be provided between the two tanks as well as between the pumps and the dosing point.

Two dosing pumps of the diaphragm type shall be provided for flocculant dosing. Each pump shall be capable of pumping at a maximum rate of 10 l/hr and accurately adjustable from 0 to 10 l/hr. The pumps shall have a positive return stroke and shall operate at a rate of not more than 72 strokes per minute. Spring return pumps are not acceptable. The pump delivery shall be constant irrespective of the liquid level in the storage tanks. One pump will be in operation at a time, and the other will be on standby.

The pumps must have a built-in flow monitoring system, which must enable the operator to accurately adjust the flow in l/hr. Each pump must also be provided with a built-in calibration tank.

All components in contact with the solution to be pumped shall be of an inert, preferably non-metallic material. All holding-down bolts shall be of grade 304 stainless steel.

PSMB. 3 **FLOCCULANT STORAGE TANKS**

Two tanks shall be provided with a storage capacity of at least 5.0 m^3 each. The tanks shall have a diameter of not more than 1.9 m. The storage tanks shall be fabricated from GRP and shall comply with the BS 4994-1973 standard. An alternative price for PVC tanks will be considered, but allowance must be made for the GRP tanks in the main offer.

Each storage tank shall be provided with a 50 mm dia inlet pipe for connection to a tanker hose (complete with valve and nib for connection) at a level 200 mm above the concrete base and for discharging at the top of the storage tank. The successful Tenderer shall comply with the chemical supplier's requirements.

Each tank shall also be provided with an access manhole (Minimum 600mm diameter), a 40 mm dia. scour valve, and a 40 mm dia. outlet valve. The scour valve shall have a drainpipe that extends to a point 50 mm beyond the concrete platform.

Each tank shall be placed on a concrete platform provided by others. The Tenderer shall provide holding down lugs so that the tank remains in position during extremely windy conditions. The tank may be exposed to the sun, rain, cold, etc. A safety factor of at least 2.5 shall be applied to the design of the wall thickness.

PSMB. 4 **PIPEWORK AND VALVES FOR FLOCCULANT DOSING PLANT**

All suction and delivery pipes, including the necessary valves and filters, shall be installed as shown on the drawings and be of Acrylonitrile Butadiene Styrene (ABS) or uPVC fabrication to SANS 966 Class 12 with a pressure rating of not less than 0 bar.

In-line roughing filters followed by fine filters with 0,5 mm apertures shall be provided on the suction line to the pumps. Safety relief valves shall be provided on the delivery line from the pumps. The safety valves shall discharge into the suction line. Means for dampening the pulsation must be provided to protect the pipework

Trenching and backfilling (if required) will be provided by others, but the Contractor under this section of the Contract shall provide and install all fasteners or clips for firmly securing the pipework to the concrete of the relevant structures, all to the satisfaction of the Engineer. Each fastener or clip and the necessary bolts shall be of grade 304 stainless steel fabrication

Air release valves shall be fitted to all high spots in the pipework where air can accumulate. Loading valves (adjustable up to 240 KPa) shall be included in the delivery line to ensure that the pumps operate as intended.

Flocculant solution shall be pumped to the dosing channel as shown in the drawings over a distance of approximately 15 m.

The Tenderer shall allow for all fittings, brackets, and holding down bolts in grade 304 stainless steel for securing the pipework.

PSMB 5 **ELECTRICAL INSTALLATION AND CONTROL**

A level control, installed upstream of the flocculant and chlorination dosing points, must control whether the flocculant dosing pumps and chlorine booster pumps can be started based on a flow or no flow signal. The flocculant dosing pumps and chlorine booster pumps shall only operate when water is let into the works, and the sensor (level control) must therefore have separate start and stop levels. The provision of the level control and electrical panel forms part of this section of the contract electrical portion of this contract.

PSMB. 6 **TESTING**

On completion of installation and putting into proper operation of all the plant and equipment, the Contractor will be required to make suitable arrangements for the testing of all plant and equipment supplied under this Section, in the presence of the Engineer or his representative.

The Contractor is to be responsible for all the costs incurred in testing with the exclusion of the supply of electricity and water.

After successful commissioning, the Contractor shall operate the plant supplied under this Section for a period of 72 hours, during which time the operators shall also be trained in the operation and control of the plant.

PSMB. 7 **CHEMICALS SUPPLIED**

The following chemicals must be supplied with the commissioning of the equipment:

- 10 000 litres of flocculant in bulk.

The total installation must, in all respects, comply with the Machinery and Occupational Safety Act and be to the satisfaction of the Engineer.

PSMC: **FLOW METERS**

PSMC.1 **SCOPE**

This section of the Contract covers the supply, delivery, transport, handling, storage, installation, commissioning, testing, adjusting, handing over in complete working order, and upholding during the Defects Liability Period of:

(a) Replacement of ONE existing raw water flow meter for coupling to an NB 150 pipe
(b) Replacement of ONE existing clear water flow meter for coupling to an NB 150 pipe
(c) All the necessary pipework and valves associated with the meter installation
(d) AIR interconnecting power, communication cabling, and display housing panels for the two meters.

PSMC.2 **DESCRIPTION**

Straight-bore in-line integrating flow meter is required. The meter shall furthermore be of the electromagnetic type.

The raw water meter will be handling raw water originating from the Rietfontein Dam, and the normal working pressure will not be higher than 20 metres of water. The meter shall be fitted with flanges (drilled class 10) on both sides, suitable for coupling to an NB 150 steel pipe with 6 mm wall thickness. The minimum flow rate in the pipeline, with one pump running, shall be in the order of 40 litres per second.

The clear water meter will be handling clear water pumped from the existing clear water sump, and the normal working pressure will not be higher than 150 metres of water. The meter shall be fitted with flanges (drilled class 16) on both sides, suitable for coupling to an NB 150 steel pipe with 6 mm wall thickness. The minimum flow rate in the pipeline, with one pump running, shall be in the order of 50 litres per second.

The designed maximum uncertainty factor shall be better than 0,25% of the actual flow rate for both the displayed reading and the transmitted signals. The basic accuracy of the meter shall be maintained between fluid velocities of 500 to 10 000 mm per second. The long-term stability of the electronic components and the flow head assembly shall be better than 0,05% of the flow rate at three meters per second over a period of 12 (twelve) months. There shall be no requirement to adjust the calibration factors or zero setting after testing and calibration.

It is essential that the complete flow meter shall be designed, manufactured, calibrated and delivered such that the original calibration parameters can easily be reconfirmed while the meter remains installed (in situ) in the service pipeline. It shall be possible to print out a confirmation calibration certificate with a full traceable accuracy to 1% of the original factory calibration certificate.

The basic accuracy and function of the meter shall not be affected by voltage variations of 15% at the nominal supply value. The electronic converter shall be clearly marked with the power supply requirements.

The signal cable connection shall be sealed against the ingress of moisture to IP 68 to withstand a permanent water head of at least four meters above the centre line of the sensor, consequent to installation.

The sensor shall be supplied with a separate electronic flow transmitter (housed in the control panel in the office building) and screened signal cable of length as required for the installation of magnetic coil power and sensor signals. The cable length ends shall be sealed against the ingress of water for transportation and storage purposes.

The environmental protection requirement for the complete sensor shall be IP 68 with four meters of water above the centre line of the sensor, and shall be suitable for installation in the valve chamber.

An engraved identification plate manufactured from a corrosion-resistant metal such as aluminium or 316 stainless steel shall be permanently fixed within 100 mm of the cable connection box. The size of the numbers/letters shall be at least 5 mm and clearly show the following information:

Manufacturer's name/Trademark

- Model No.
- Serial No.
- Diameter
- Body material
- Liner material
- Calibration factors
- Serial numbers
- Tag number
- The maximum working pressure
- The test pressure
- Any other which the vendor may like to specify

The transmitter enclosure shall be suitable for the protection of the electronic components from exposure to ambient conditions associated with temperature variations from minus 10°C to plus 40°C, with relative humidity from 20% to 95% condensing. The environmental protection for the electronic converter module shall not be less than TP 65.

The transmitter shall be microprocessor-based, re-programmable, rugged, and have an assessed mean time between failure in excess of 25 000 hours. The unit shall incorporate an illuminated digital display that is readable in low light conditions.

The digital display shall have a two-line display, capable of displaying the flow rate, in engineering units of m^3/hr, as well as the totalised values in the engineering units of m^3. The display shall have a minimum of eight digits to display the totalised flow values. The totalised values shall NOT be able to be reset at any time nor during power failures. The totalised values shall continue in increments until a maximum displayable value is reached, upon which it will rest at zero.

The Electronic Flow Transmitter shall provide galvanically isolated dual analogue current output signals directly proportional to the flow rate. The signal output shall be 4 to 20 mA, each capable of feeding into a load of 750 Ohms. The frequency output pulses shall be in direct proportion to the respective flow rate and the contacts rated at 25 Volts and 250 mA DC.

Simultaneous isolated 4-20 mA into a 500-ohm load (maximum 750 ohms), liner proportional to range selected (in accordance with ISA-S50.1), and serial communication.

The supply voltage shall be 230 VAC. The supply shall be supplied under the electrical section of this contract and shall be to the office building. The flow meter shall be supplied with a dual-channel GPRS data logger that accepts both the rate of flow and integration outputs from the flow meter.

Lightning protection as prescribed by the suppliers shall be provided on the signal as well as on the power cable. The location of the existing flow meters is shown on the drawings.

The converter and data logger shall be housed in a combined panel to be wall-mounted inside the new office building, approximately 25 meters from the flow meters. The panel shall have a window on the door, and the LCD display shall be mounted in the door of the panel, behind the window. Accuracy should be at least 0.4%.

The rate of flow shall be indicated and recorded in litres per second, and the total flow shall be measured in kilolitres.

One spare data black for the logger shall also be provided.

PSMC.3 **PIPEWORK**

Tenderers shall include the supply, delivery, and erection of all necessary pipework, valves, and Viking Johnson couplings to suit the layout and diameters of the existing pipework.

The thickness of the steel plate used in the manufacture of the pipes and fittings shall not be less than 6 mm.

All pipes and fittings for the raw and clear water lines shall be suitable for maximum pressures of 10 and 160 metres, respectively.

The layout of pipework shall be such as to facilitate dismantling and inspection. The pipes are to be properly supported and so arranged that all stresses created in the pipeline by static and dynamic forces, including recoil shock, will be taken up by suitable anchors. The pipework sizes shall be as shown on the drawings.

PSMC.4 TESTING

On completion of the installation of the flow meters and of rendering it operational, the Contractor shall make suitable arrangements to test it in the presence of the Engineer.

The meters shall be tested over their whole range of flow.

The rate of flow during testing shall be determined by timing the rise in water level in the clarified. The accumulative recorder will be tested in a similar manner.

The Contractor is to be responsible for all the costs incurred in testing.

In comparing the test results with the tendered meter characteristics, the following tolerances will be allowed:

Delivery rate:	- 3% to + 3%
Accumulative recording rate:	- 3% to + 3%

PSMC.5 **ELECTRICAL INSTALLATION**

The supply and installation of an approved control board (housing panel) fully equipped for the plant, offered together with interconnecting cables, form part of this Section of the Contract. The control board will be wall-mounted inside the new office building, which is situated approximately 25m from the flow meters. The electrical supply to the control board will be supplied under another Section of this Contract and is fully described under Section PSE 7.2. The Contractor under this Section of the Contract will, however, be responsible for all the electrical and communication cabling between the converter and the meter and for the connection of the supply cable to the control board, as well as the lightning protection as recommended by the equipment supplier.

The Contractor shall install all cabling and trenching where required. Cables buried under ground shall be housed in HDPE cable sleeves of approved diameter, and where installed above ground, shall be installed in 25mm diameter galvanised tubing

PSMD: **RAPID GRAVITY FILTRATION EQUIPMENT**

PSMD.1 **SCOPE**

This section of the Contract covers the supply, delivery, transport, handling, storage, installation, commissioning, testing, adjusting, and handing over in complete working order and upholding during the Defects Liability Period of rapid gravity filtration equipment, comprising:

a) THREE filters complete with media;
b) ALL interconnecting pipework, valves, and controls;
c) TWO wash water pumps
d) Modification to the existing air blower
e) ONE submersible drainage pump (gland leakage) and pipework

PSMD.2 **DESCRIPTION**

The effluent to be filtered will be water that has been coagulated and flocculated and then clarified by means of sedimentation.

THREE new filters, each with dimensions of 2.4 m (wide) x 7.20 m (long), are required for a total water flow of 34.7 l/sec (125 m^3/hr), and they shall be of the single media variety. The dimensions of the new filters are shown on the Drawings.

Simplicity and reliability of operation of the plant will play an important role in tender adjudication. All control equipment (including headstocks and valves) should therefore be easily manipulated, readily accessible, and clearly marked as to their relevant uses. All valves shall close in a clockwise direction when viewed from above.

The filter floor shall be a false floor system. Alternative offers, such as for lateral pipe systems, will only be considered where it is included as a separate alternative offer and the main offer makes provision for the false floor system.

PSMD.3 **REQUIRED FILTER DUTY**

The filter plant to be supplied under this Contract shall have a filtering rate of 5.d m/hr, but must be able to operate under a 50 % overload for the periods it takes to backwash one filter.

PSMD.4 **FILTER FLOW CONTROL**

The filters will be of the declining rate, variable level type. Head loss and flow rate instrumentation will not be required.

The inlet pipework to each filter will be situated on the outside of the filter building and will include an inlet control valve and backwash-water outlet valve or sluice gate, each to be manually controlled with a headstock situated on the walkway above. l00mm diameter openings for the spindles between the valves and headstock will be provided by the Civil Contractor under the supervision of the Mechanical Contractor.

The outlet pipework of each filter will be situated in the filter gallery inside the filter building and will include a filter outlet valve, air scour inlet valve, and backwash-water inlet valve, each to be manually controlled with a headstock situated on the filter gallery walkway above. 100mm diameter openings for the spindles between the valves and headstock will be provided by the Civil Contractor under the supervision of the Mechanical Contractor.

All the control valves shall be double flanged butterfly valves (OZ-KAN or similar approved), double eccentric, water-type valves with stainless steel body seat, stainless steel retaining ring with EPDM replaceable seal, and shall be epoxy coated internally and externally to a dry film thickness of not less than 250 microns. Butterfly valves shall further be provided with

gearboxes that shall incorporate a mounting flange for possible future mounting of an electric actuator. The direction of closing shall suit the setup with the headstocks in order to ensure that all headstocks close in a clockwise direction when viewed from the top.

Each filter shall be equipped with a backwash level indicator to indicate a predetermined backwash level, which shall be set at level 1372.900 m. The backwash level indicators will be fixed to the inside concrete walls of each filter.

A 75 mm diameter orifice plate will be installed on the 150 mm diameter effluent line of each fitter in order to limit the starting rate on a Glean filter.

PSMD.5 **FILTER OPERATION CONTROL**

As stated above, all filter control valves will be operated manually with headstocks situated on the walkway slabs above the valves, all as shown in the drawings. Automatic control of filter equipment will not be considered, but as stated above, the gearboxes must make provision for possible future connection to actuators.

All valves shall be readily accessible and clearly marked as to their relevant uses. All valves must be placed in such a manner that all operations may be manually initiated from within the pipe gallery area or on the outside walkway, as indicated in the drawings. All filter operating valves must be supplied with gear Doxes and operated by headstocks. The headstocks must also be clearly marked as to their relevant uses.

PSMD.6 **FILTER BACKWASHING**

The system of backwashing the filter is to be of proven efficiency, ensuring the thorough agitation and cleaning of the filter media without loss of media, and the prevention of mud balling, cracking, and gumming up. Backwashing is to be carried out by a reverse flow of air scour and wash water.

PSMD.7 **BACKWASH PUMPS**

TWO pumps shall be provided, one acting as a standby for the other, each with a capacity sufficient for backwashing one filter at a time. The backwash pumps shall be sized for an up-flow rate of approximately 35 m/hr with a 20% bed expansion. Such capacity should nevertheless not be less than 84 //sec (302.4 m^3/hr) at a head toss which will be determined by the sand media packing, filter floor layout, and filter pipework.

The pumps shall be complete with drive motors, drive couplings, baseplates, holding down bolts, isolating valves, non-return valves, suction and discharge pressure gauges (kPa), and interconnecting pipework. All pipework and fittings shall comply with the requirements of SANS 719, where applicable, and shall be made of mild steel plate of not less than 6 mm thickness and shall be thoroughly cleaned by grit blasting in accordance with Part S Section 3 clause PMA.3.2 of this document, and coated within four (4) hours after cleaning with a polyamide-cured epoxy system similar and equal to Copon EP 2300, externally and internally. The coating shall be built up to a dry film thickness of 400 microns, as prescribed by the manufacturer.

The layout of pipework shall be such as to facilitate dismantling and inspection. The pipes are to be properly supported and so arranged that all stresses created in the pipeline by static and dynamic forces, including recoil shock, will be taken up by suitable anchors. The pipework sizes shall be as shown on the drawings.

The isolation valves on the delivery and suction side of the wash water pumps shall be double flanged, butterfly valves (OZ-KAN or similar approved), double eccentric, water type valves with stainless steel body seat, stainless steel retaining ring with EPDM replaceable seal, and shall be epoxy coated internally and externally to a dry film thickness of minimum 250 microns. Butterfly valves shall further be provided with gearboxes that shall incorporate a mounting flange for possible future mounting of an electric actuator.

The non-return valves on the delivery side shall be silent check valves (OZ-KAN or similar approved). The valves shall be double flanged, with a stainless steel retaining ring with an EPDM replaceable seal, and shall be epoxy coated internally and externally to a dry film thickness of minimum 250 microns.

The pumps and motors shall comply with the pump specification in Section PMA, as well as the specific specifications as detailed under Section PS ME, Pumps.

PSMD.8 **AIR BLOWER (RE-USE EXISTING BLOWER)**

The existing air blower shall be reused and modified for the new filters.

The ONE air blower shall be provided, with a capacity to air scour one filter at a time at a rate of 45 m^3 (free air)/m^2/h (i.e., 6.47 m^3 (free air)/min).

The air blower will be positioned together with the backwash pumps in the filter/pump house, and Tenderers must include the interconnecting pipework from the blower fa the individual filters. All as shown on the drawings.

All pipework and fittings shall comply with the requirements of SANS 719, where applicable, and shall be made of mild steel plate of not less than 6 mm thickness and shall be thoroughly cleaned by 9 it blasting in accordance with Part S Section 3 clause PMA. 3.2 of this document, and coated within four (4) hours after cleaning with a polyamide-cured epoxy system similar and equal to Copon EP 2300, externally and internally. The coating shall be built up to a dry film thickness of 400 microns, as prescribed by the manufacturer.

The layout of pipework shall be such as to facilitate dismantling and inspection. The pipes are to be properly supported and so arranged that all stresses created in the pipeline by static and dynamic forces, including recoil shock, will be taken up by suitable anchors. The pipework sizes shall be as shown on the drawings.

PSMD.9 **FILTER MEDIA**

The media in each filter shall consist of a 90 mm layer of coarse material with an effective size of 6 mm on top of which shall be a 810 mm depth of fine sand with an effective size of 0.65 mm and a uniformity coefficient of less than 1.65.

The sand shall be of hard, clean quarzitic nature and of approved origin and shall be properly graded so as to prevent the development of cracks in the filter beds. The sand shall have a hydrochloric acid solubility of less than 5 percent when tested in accordance with AWWA Standard B100-53 and shall have a specific gravity of not less than 2.6 and be clean

After placement of the media in the filter, the media shall be backwashed three times, and the top 5 mm of very fine material carefully scraped off and discarded (if necessary).

The quantity of sand supplied shall be 5 percent in excess of that necessary to form the original bed in order to provide for loss by washing. Media shall be dispatched to the site in bags, the quality of which must be approved by the Engineer prior to dispatch. The excess material shall be left in 50 kg bags and be handed over to the Employer.

PSMD.10 PIPEWORK, NOZZLES INSIDE FILTER

Tenderers must include all distribution pipework, nozzles, etc., in the filters, including all necessary holding down bolts, etc. Tenderers must also provide for an access hatch to each filter.

The nozzles must be equally spaced with a minimum of 35 nozzles/m^2. Nozzles must be slotted cap nozzles with slot opening sizes to suit the filter media.

All pipework and fittings shall comp1y with the requirements of SANS 719, where applicable, and shall be made of mild steel plate of not 1ess than 6 mm thickness ana shall be thoroughly c1eaned by grit blasting in accordance with Part S Section 3 clause PMA.3.2 of this document, and coated within four (4) hours after cleaning with a polyamide-cured epoxy system similar and equal to Copon EP 2300, externally and internally. The coating shall be built up to a dry film thickness of 400 microns, as prescribed by the manufacturer.

Grouting in of pipework and of holding down bolts will be carried out by the Civil Contractor, but any special work required in relation to the equipment supplied must be allowed for in the rates for installation thereof. The pipework and control equipment for each of the filters shall be easily accessible for repair and painting in the dry. Pipes that pass through or are cast into concrete shall be provided with puddle flanges. Flexible couplings shall be provided in suction pipes between pumps and the concrete and in convenient positions to facilitate the removal of all pumps and valves.

The diameters of the pipework shall be as shown on the Tender Drawings

The tendered price for equipment shall include the cost of providing instruments for testing the thickness of the coating and for testing for pin holes.

PSMD.11 FILTER FLOORS

The filter floor shall be a monolithic, false floor system. Alternative offers, such as for lateral pipe systems, will not be considered.

The Civil Contractor will provide 35 MPa concrete for the filter false floor and place it under the supervision of the Mechanical Contractor. Apart from the supply and placement of the

concrete, the Mechanical Contractor must allow in his pricing for the full construction of the false floor, including the design, supply, and installation of all reinforcement steel required. For alternative offers, it must also be accepted that the Civil Contractor will only provide and place concrete. For clarity, the Mechanical Contractor must clearly indicate in the Data Sheets the work required to be done by the Civil Contractor in the construction of the filter floors.

PSMD.12 **TESTING AND COMMISSIONING OF FILTER PLANT**

The whole plant shall be left in proper working order, with neat and finished appearance, and in first-class condition to the entire satisfaction of the Engineer.

The plant shall then be operated by the Contractor for at least 72 hours or such longer time as may be necessary in order to put all equipment into proper adjustment. He shall calibrate any equipment requiring calibration, using the water, chemicals, and power provided for in this Contract. Thereafter, he shall instruct and train the Employer‘s officials in the proper operation of the plant. This training shall be done as and when ordered by the Engineer and shall be paid on an hourly basis as provided in the schedule of prices.

Thereafter, if satisfactory in every respect, the plant shall be handed over to the Employer's officials, and the 12-month maintenance period shall commence.

PSMD.13 **DRAINAGE PUMP (Gland leakage)**

One drainage submersible centrifugal sump pump equipped with automatic controls (high level-on, and low level-off) is required.

The gland leakage pump shall be installed in the drainage sump of the filter pump house to pump leakage liquid over a distance of approximately 28 m to a suitable location. The pump shall be sized to pump at a minimum rate of 1.5l/s. The maximum static head will be approximately 3.5 m.

The pump shall be equipped with an open or vortex-type impeller, capable of passing solids up to 20 mm in diameter.

The delivery pipework supplied with the pump shall have a minimum diameter of 50mm and shall be screwed and socketed heavy-duty galvanised mild steel pipes. A suitable non-return valve shall be installed in the delivery line immediately downstream of the pumps. The position of the pump and delivery pipework is shown in the tender drawings

PSMD.14 **ELECTRICAL INSTALLATION**

The supply and installation of switchboards, starters, controls, and power cables will be the subject of a separate portion of the contract and will be carried out in accordance with the requirements of the Contractor for this section of the Contract, who will be required to produce detailed one-line diagrams indicating the exact electrical requirements and interlocks for all his equipment.

PSMD.15 **LIFTING GEAR**

The Contractor shall provide lifting gear (travelling trolley, block and tackle) for lifting the pumps and air blower inside the pump house portion of the filter building.

The crawl beam for the lifting gear (203 x 133 x 30 kg/m) will be supplied and installed under another Contractor, but the Contractor under this Section of the Contract shall supply and install a suitable manually operated lifting• gear. Full details of the lifting gear shall be provided with the tender. A vertical distance of 6 200 mm from the crawl beam to the ground shall be allowed for.

The total installation must, in all respects, comply with the Machinery and Occupational Safety Act and be to the satisfaction of the Engineer.

PSMD-A: **ALTERNATIVE FILTERS**

The tenderer may, as an alternative offer, sand filtration or multimedia pressure filters. Important design parameters need to be listed in the returnable schedules, including design filtration rate, as well as maximum filtration rate when a filter is taken out of operation temporarily for backwashing and rinsing. The maximum linear filtration rate may not be more than 7.5 $m^3/m^2/hr$

In order to facilitate process flexibility and ease of operation, a minimum of three (3) pressure filters needs to be provided in order to limit filtration rates during backwashing. The maximum number of filters shall be limited to five (5).

Two (2) dedicated filter feed pumps (duty/standby) and two (2) dedicated backwash pumps (duty/standby), and one (1) dedicated backwash blower shall be provided. The tenderer may use the existing blower.

The backwash sequence shall include air scour followed by water wash and/or a combined air/water wash. The backwash sequence shall be fully automated and shall be initiated automatically. The backwash sequence shall be initiated once every 24 hours, or once the differential pressure across any one filter exceeds a clogging head of 2 m.

The backwash sequence shall include air scour followed by water wash and/or a combined air/water wash. The backwash sequence shall be fully automated and shall be initiated automatically. The backwash sequence shall be initiated once every 24 hours, or once the differential pressure across any one filter exceeds a clogging head of 2.5 m.

Initiation of the backwash sequence shall be automatic

The filters supplied shall be of the pressure filter type, designed according to the relevant national and international specifications. The material of construction shall be suitably selected to withstand the corrosive action of the water or lined with a suitable lining.

The pressure filters shall be contained in a designated building (plant building) with a suitably designed and constructed foundation, all required plinths for additional plant and roof. All civil wards shall be included by the contractor for the alternative offer. Conceptual design drawings of the proposed plant building and civil works shall be submitted in the tender

As a minimum, the tenderer shall include the following with the alternative:

- The Process design, process flow diagram (including flows), process description, Pipe and Instrumentation Diagrams, and sizes of equipment/structures;
- Plans indicating the General Layout of the Works;
- Conceptual design drawings of all civil works (i.e., Plant Building)
- Description and/or sketches/drawings of Mechanical and Electrical equipment;
- Quality Assurance system for all aspects of work;
- Training of the client's operating staff on site for a minimum of 5 days;
- Proof of suitably qualified and experienced professional engineers to be involved in the design of the works; and
- Proof of professional indemnity insurance

PSME PUMPING EQUIPMENT

PSME.1 SCOPE

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order, and upholding during the Defects Liability period of the following equipment.

(a) TWO Wolwas Raw Water pumps of the inclined axial flow (propeller) type for pumping raw water from the upper Rietfontein Dam to Wolwas Dam No.1
(b) TWO Raw Water pumps of the horizontal shaft dry well type for pumping raw water from the Wolwas Dams to the Water Treatment Works.
(c) TWO Clear Water pumps of the horizontal shaft dry well type for pumping clear water from the Clear Water Sump to the Clear Water Reservoirs Dams
(d) Two Washwater Recovery pumps of the submersible type for pumping wash water from the sludge ponds to the inlet of the Water Treatment Works
(e) ONE submersible drainage pump (gland leakage) and pipework in the Rietfontein Raw Water Pump Station
(f) ONE submersible drainage pump (gland leakage) and pipework in the Clear Water Pump Station
(g) Pipework and accessories for the abovementioned pumps.
(h) ONE Lifting rig (travelling trolley, block and tackle) for the Washwater Pump Station (submersible)

PSME.2 GENERAL

Dry well pumping equipment shall mean equipment of which the motors may or may not be submersible, but which operates in a non-submersible mode.

The design of the pumps shall be in accordance with BS 5257.

Ali working parts of the pumps shall be removable and serviceable and shall under no circumstances be integrated into the body of the pumps.

Large pumps shall be designed to incorporate transducers for the monitoring of:
(a) The vibration of the pumps, and

(b) The oil temperature of the bearings of the pumps

PSME.3 CENTRIFUGAL PUMPS

PSME.3.1 General

Dry-well pumps supplied under this contract shall be of the centrifugal type. It shall be suitable to pump the media mentioned in the particular specification for each type of application (sludge or settled sewage, etc).

PSME.3.2 Pump Layout

Together with the tenders, Tenderers shall provide full details of the proposed pump layouts, including all pipework to comply with the requirements of the pumping system as shown on the drawings, for consideration by the Engineer.

PSME.3.3 Material of construction of casing

The pumps shall be of the maker's standard and approved design, low maintenance and robust.

The pump casing shall be manufactured from high-grade cast iron, rigidly secured to a bed plate or base and shall be finished off smoothly before a corrosion protection system is applied.

The casing shall be selected for a minimum of 1 000 kPa or 1.5 times the actual discharge pressure, whichever is greater.

PSME.3.4 Pump Speeds

The pump shall have a rotational speed of not more than 1500 rpm and shall be so balanced that there will be no end thrust when the pumps are new or after wear has taken place, or alternatively, suitable heavy-duty thrust bearings shall be provided.

The pump shall be of the self-regulating type and where the power consumption characteristic is such that with an increase in delivery to beyond a certain limit, the power consumption decreases, thereby ensuring that the motor is not overloaded in the event of a large deduction in pumping head

PSME.3.5 Pump Impellers

The impellers shall be carefully bored and keyed. All parts inaccessible to machining shall have a smooth finish. Impellers shall be made of high-grade cast iron.

PSME.3.6 Pump Shafts

The shaft shall be manufactured of high tensile steel. Where the shaft passes through stuffing boxes, it shall be fitted with renewable sleeves of high-quality, wear-resistant alloys. The shaft shall be so designed that the running speed is well below the first critical speed and the rotor shall be accurately balanced after assembly.

The rotating elements shall be accurately balanced statically and dynamically to eliminate noise and vibration when running

PSME.3.7 **Lubrication**

Efficient means of lubrication shall be provided for all bearings. Preference will be given to oil-lubricated bearings as opposed to grease-lubricated bearings. Screw closing oil dipsticks or sight glasses are required for all bearings as well as oil drain plugs.

If pumps with grease-lubricated bearings are offered, these shall be provided with lubricators

PSME.3.8 **Bearings**

All pumps shall be fitted with either ball or roller bearings.

Suitable lubrication arrangements shall be provided for the bearings, as well as sufficient bearing area

Special bearings shall be provided to absorb any axial thrust that may be caused by the characteristics of the impeller or by the type of coupling selected between the pump and the motor.
Bearing numbers shall be given for all bearings in the pumps to facilitate replacement.

Bearings shall have a B10-life of 50 000 hours.

PSME.3.9 **Wearing Rings**

Pumps containing wearing rings shall be fitted with high-quality wearing rings that shall be easily replaceable.

PSME.3.10 **Coupling between the pump and the motor**

The pumps and motors shall be directly coupled with a suitable type of coupling that will satisfactorily take up minor misalignment or offsetting of the motor and pump shaft.

The coupling shall be designed in such a manner that no thrust will be transmitted from the motor to the pump or vice versa.

The coupling shall be robust and shall be readily dismantled and reassembled. A strong steel cover shall be provided over the coupling for the prevention of accidents.

Pumps shall not be fitted with V-belt coupling systems.

PSME.3.11 **Pump Motors**

Each pump shall be fitted with an electric motor. Each electric motor shall comply with the requirements as specified in the Particular and Generic Specifications in section PMA (Clause PMA 4.2).

PSME.3.12 **Base Plate and Alignment**

The pump and electric motor shall be mounted on a combination base plate of fabricated steel construction. Machined facings shall be provided to receive the pump and motor.

The pumps shall be mounted on base plates of rigid construction, provided with suitable openings for pouring in grout and all necessary holding down bolts for securing to the foundations.

Concrete work of the foundations will be finished to approximately 20 mm below the underside of the base plate, and, in erecting the pump and motor, the Contractor shall arrange for the setting of each unit to exact line or level by means of steel wedges. Thereafter, the mechanical contractor will fix the base plates to the pump foundations with suitable holding down bolts. The civil construction contractor will fill the empty space inside the base plate with grout, under the supervision of and to the satisfaction of the Contractor under this section of the Contract. Alignment shall then be re-checked.

Before dispatch, the motor of each pumping set is to be mounted in proper alignment with the pump on the common base plate.

The Contractor shall be responsible for the rectification of any excessive noise and/or vibration caused by the operation of the pump installation.

If required by the pump manufacturer, or excessive vibration can be expected, vibration isolating mountings shall be installed in accordance with the manufacturer's instructions. However, the contractor shall be responsible for ensuring that the amplitude of motion and vibration transmission will not exceed the specified limits.

PSME.3.13 **Accessories**

AU pumps shall be fitted with air cocks, drain cocks, and lifting eyes if the weight of the pump is more than 30 kg, and all guards, etc., required in terms of the Occupational Health and Safety Act (Act 85 of 1993). Furthermore, the pump shall be fitted with adequate protection devices (e.g., positive displacement pumps shall be fitted with pressure relief devices set at the maximum working head of the pump and piped back to the pump's sump, etc.).

All dry well pumps shall be equipped with facilities for attaching pressure gauges on the delivery and suction sides of the pumps. These facilities shall be equipped with isolation cocks to allow removal of the gauge when not in use. The facilities shall be located two diameters from the inlet and outlet flanges of pumps, as per BS 5316.

Each pump set shall be fitted with the necessary approved and calibrated glycerine-filled pressure gauges suitably dampened against vibration. One pressure gauge shall be supplied on the delivery side of each pump and one pressure gauge on the suction side. Gauges shall be fitted with clog-free in-line pressure sensors with flexible rubber sleeves of the membrane type.

(i) The discharge pressure gauge shall have a maximum reading of not more than 40% in excess of the closed valve pressure of the pump.

(ii) The suction pressure gauge shall have a scale reading from at least minus 50 kPa to at least plus 50 kPa

The location of pressure gauges shall also be such that the gauge is easily accessible and can be clearly seen from the pump stop/start box

PSME.3.14 **Priming of Pumps**

Note: Where the pump is so installed that it is dependent on a foot valve or reflux valve to maintain priming at start-up, it shall be provided with additional priming arrangements, such as piping and valves not less than 50 mm in diameter, supplied from a head tank well above the pump. An electrically operated priming pump or hand hand-operated diaphragm pump will also be considered. Where an adequate volume of water is available in the discharge line at low head, priming may be carried out by means of a bypass around the discharge reflux valve.

PSME.3.15 **Pump Technical Details**

The pump shall be a currently catalogued product. Documentation shall include performance curves or selection tables, indicating flow, head, NPSH required, power absorbed, speed, and efficiency for the expected range of operational conditions.

Performance curves and selection tables shall be based on reproducible and certified tests carried out in approved laboratories.

The flow rate at the break-off point of the curve for the impeller selected shall be at least 1.5 times that of the maximum flow rate specified.

The head at zero delivery of the curve for the impeller selected shall be at least 1.2 times the maximum head in the pump's duty range.

The pumps shall be installed in accordance with the manufacturer's instructions and shall be maintained in "as new" condition at start-up.

The pumps and electric motors shall be aligned to within 0.05 mm, both radially and directionally, to avoid vibration, and shall be bolted to the base. Construction: Pumas shall be of the horizontal pull-out, in-line block design, with pump and motor having separate shafts. Standard flange-mounted motors shall be used in order to facilitate easy replacement of either pump or motor in the event of failure.

Pumps shall be specially designed and selected for quiet operation. All pumps shall be supplied complete with electrical motors.

Lifting eyes or lugs shall be provided for parts with a mass exceeding 25 kg. Complete overhauling of the pump shall be possible without having to damage piping.

Water shall not spill over the pump house floor; condensate and gland leakage (here applicable) shall be piped to the drainage system in the pump house.

A metal lubrication instruction plate shall be attached to the pump where it is clearly visible. The plate shall indicate the recommended lubricant, points of lubrication, and the recommended frequency of lubrication.

Regarding the stated service life (per technical data sheets), the Engineer or his representative reserves the right to call for:

(a) Test certificates and reports from the manufacturer's quality control laboratory or an independent test laboratory such as SANS, and/or
(b) Site inspection, customer reports/references, and users' interviews, and/or
(c) Full engineering, design, and component selection details. in order to check the correctness of the service life claimed.

PSME.3.16 Air Release

All horizontal shaft pumps and delivery pipework with local high points or positions upstream of the reflux valves where air can be trapped shall be equipped with the necessary drains and air cocks or automatic air release equipment with pipe connections for discharging from the drains to the drainage system in the pump house.

PSME.3.17 Gland Sealing

The pump shaft shall be sealed against leakage by a mechanical seal. Both the stationary sealing member and the mated rotating member shall be of tungsten-titanium carbide alloy. Each of the mating surfaces shall be lapped to a flatness of one-half light band (5.8 millionths of an inch), as measured by the optical flat monochromatic light. The stationary seal seat shall be double floating so that faces will not lose alignment during periods of shock loads that will cause deflection, vibration, and axial or radial movement of the pump shaft.

The seal shall be lubricated with oil from a separate, oil-filled reservoir. The same oil shall not be used to lubricate both the shaft seal and the shaft bearing

PSME.3.18 Pipework

Each pump set shall be fitted with the necessary approved pipework, flexible couplings, valves, pipe supports, and bends, as shown in the drawings.

Layouts of pumps, pipework, and valves are shown on the drawings. Should the tenderer consider alternative layouts, then fully detailed drawings showing the proposed layout of pumps and pipework shall be submitted with the tender.

The pipework shall be of mild steel with corrosion protection as specified and shall be flanged and drilled to SABS 1J23 Table 1600/3. Bends and branches shall provide non-turbulent flow conditions and the layout of the pipework shall be such as to facilitate dismantling and inspection. The pipes are to be properly supported and so arranged that all stresses created in the pipeline by static and dynamic forces, including recoil shock, will be taken up by

suitable anchors. Unless a specific size is specified, pipework shall be sized so as to limit maximum flow velocities to 1,5 metres per second.

Pipes shall be thoroughly cleaned by grit blasting in accordance with Part S Section 3 clause PMA.3.2 of this document, and coated within four (4) hours after cleaning with a polyamide-cured epoxy system similar and equal to Copon EP 2300, externally and internally. The coating shall be built up to a dry film thickness of 400 microns, as prescribed by the manufacturer.

The tendered price for pipe-work shall include the cost of providing instruments for testing the thickness of the coating and for testing for pin holes.

Pipes and fittings of nominal bore up to 200 mm shall be of heavy series seamless steel pipes complying with the requirements of SABS 62.

Pipes of nominal bore over 200 mm shall be Grade B with a minimum wall thickness of 6 mm and shall comply with the requirements of SABS 719. The height of the inner weld reinforcement and of upset metal on the inner surface shall not exceed 1 mm. Pipe fittings and specials of nominal bore over 200 mm shall be fabricated in accordance with BS 534 from pipe complying with SABS 719 as prescribed above.

All suction and delivery pipework shall be provided with a flexible coupling in a convenient position to facilitate the removal and reinstallation of a pump.

All brackets and supports in dry wells of pump stations shall be of galvanized mild steel and shall be of grade 304 stainless steel in wet wells of pump stations.

In addition, all the necessary equipment and lifting gear for manual removal of and replacement of pumps for maintenance purposes shall be supplied and installed under this section of the contract. The lifting gear shall be sufficiently protected against corrosion. The lifting gear shall be fitted with a cog with good lever advantage for lifting of the unit without the necessity of great force. The gear must be designed for a clear lifting operation that will make wash-down of the equipment possible on removal of a unit. Full details of the guide rails and lifting gear shall be provided with the tender.

All guide rails, duck foot bends, lifting eyes, chains, block-and-tackle etc. required for the operation of the pumps offered, are to be included in the Contractor's supply.

All pipe specials shall be free of weld spatter, and all sharp corners and edges shall be ground smooth and round before painting.

The delivery pipework shall terminate (unless otherwise shown on the drawing) in a flanged puddle pipe 300 mm clear of the wall outside the structure, suitable for connection to the delivery pipes. Each delivery line shall be equipped with facilities for attaching pressure gauges. These facilities shall be equipped with isolation cocks to allow the removal of the gauge when not in use. The facilities shall be located inside the valve box.

Each delivery line shall be provided with a gate valve and a non-return valve as specified and as indicated in the drawings. All gate valves shall be waterworks pattern as specified. Non-return valves shall be swing check reflux valves for all pump stations.

Check valves on delivery mains shall only be used in a horizontal position.

PSME.4 PUMP MOTORS

Low Voltage Electric Motors

All electric motors shall fully comply with the following relevant standards: SANS 1189, SANS 948, BS 4999 and BS 5000 or IECS 34 and IECS 72.

When ordering electric motors for a specific application, the Contractor shall ensure that the orientation of the terminal boxes on the motors is suitable for vertical cable entry from below, with the motor installed in position and provided with suitable cable entry holes to accommodate the specific cable glands (Holes to be tapped in case of cast boxes).

All three-phase low-voltage motors shall be of the squirrel cage induction type,

Unless a power rating for a motor is specified, all motors 3hall be rated for continuous operation (Duty Class S1) at an output of 15 % in excess of the maximum power requirements of the associated driven plant when operating at the maximum specified duty at an ambient temperature of 40 °C and an altitude of the specific site. The minimum class of insulation shall be class F according to SANS 948

The motors shall be of a recommended standard rating, and if the requirements given above fall between two standard ratings, motors of the next higher standard rating must be provided.

The motors shall be either fixed speed, dual speed or speed control units, as required. All motors shall, where possible, be from the same manufacturer to prevent stocking a variety of spares.

The motor speed shall match that of the driven plant but shall not be in excess of 1 500 r.p.m. unless otherwise required.

All motors shall be suitable for “direct-on-line" starting unless "star/delta" or other starting methods are prescribed by the supply authority.

The maximum starting current of these motors under locked rotor conditions with specified voltage applied to the motor terminals shall not exceed six times the normal full load current.

The motors shall be suitably rated for 15 starts per hour at an ambient temperature of 40 °C. and the altitude of the site.

All submersible motors shall be of the IP 68 type and all other motors shall be of the IP 55 IC 01 41 type.

Anti-condensation heating shall be provided on motors rated at 7.5 kW and above and shall be effected by means of an internally fitted 230 V tape heater. Motors of7.5kW and above shall each be equipped with temperature sensors embedded in the overhang of the windings (one per phase) and motors rated at 22 kW and above shall each be equipped with three thermistors with a positive temperature coefficient of resistance embedded in the overhang of the stator windings (one per phase) to facilitate the operation of protective devices on overheating of the relevant motor. These thermistors and heaters shall be wired to suitable separate terminal boxes on the outside of the motors.

All submersible motors shall be supplied complete with adequately rated underwater cables factory connected onto the motors, for power supply as well as sensing, where applicable. These cables shall be of sufficient length to reach the connection points, i.e. the nearest readily accessible dry area, without straining the cables and shall have watertight connections onto the motor. Exact lengths of cables required shall be verified on site before finalising orders.

Motor selection for frequency converter variable speed applications shall allow for the following:

a) The maximum torque of the motor must be 42% greater than the torque required by the driven plant over the whole speed range. It shall be confirmed by the Tenderer whether it is allowable to connect a larger motor than normal to the driven plant.
b) The ratio between the maximum torque and the rated torque of the motor must be less than 2.5
c) The method of cooling of the motor shall be efficient for continuous operation over the whole speed range of the motor and shall either be a self-ventilated or separately ventilated type of motor.
d) The rated speed of the motor shall be as close as possible to the nominal speed of the driven plant.
e) Four-pole motors will be preferred, but motors with more poles will be acceptable if direct-on-line starting will be adversely affected by the four-pole motor.
f) Motor winding insulation must be compatible with frequency converter variable speed operation.
g) Noise levels of the motor shall not exceed the value given in SANS 948 appropriate to the rated output and speed range of the motor.
h) Vibration levels of the motor shall not exceed acceptable vibration amplitudes through the speed range when operating in conjunction with frequency converter variable speed applications.

Dual-speed motors shall have separate windings, each with a differing number of poles. Motor ventilation shall be efficient at the required load torque of the driven plant at both speed settings.

Vibration and noise levels shall not exceed values given in SANS 948 appropriate to the rated output and speed of the motor.

Each motor shall be provided with a grade 304 stainless steel or brass nameplate.

The following information shall be submitted with each Tender in respect of all the three-phase low-voltage motors offered:

a) Two copies of an outline drawing showing the main overall dimensions.
b) Guaranteed continuous rating under site conditions.
c) Guaranteed number of starts per hour at an ambient temperature of 40 °C.
d) Guaranteed maximum starting current under locked rotor conditions with the normal voltage connected to the incoming terminals.
e) Guaranteed efficiency of the motor at 50 % and 100 % normal full load with motor windings connected in delta.
f) Guaranteed power factor of the motor at 50 % and 100 % normal full load with the motor windings connected in delta.
g) The mass of each motor.
h) Copies of SANS test reports if these motors carry the SANS mark.

The following tests shall be carried out at the Manufacturer's Works on these motors after manufacture:

If the motors do not carry the SANS mark, performance and efficiency tests shall be carried out to prove the guaranteed information submitted with the successful Tender.

These tests must be performed by the South African Bureau of Standards, and a certificate of approval must be submitted stating that the motors comply with the requirements of SANS 948.

All motors shall be subjected to routine tests as prescribed in Appendix D to SANS 948.

The manufacturer must submit to the Engineer two certified copies of test certificates reflecting the conditions and results of the tests carried out on each motor.
After installation on the Site, but prior to commissioning, the following tests shall be carried out:

a) Ensure that the bearings are properly lubricated.
b) Ensure that all power and earth connections are properly made
c) Check all ventilation openings for obstruction.
d) Measure the insulation resistance between phases mutually and between each phase and earth to ensure that the windings are dry.
e) Spin the motor by briefly switching the supply on to check the correctness of the direction of rotation.
f) After the motor has been started, the following shall be observed:
g) Smoothness and period of acceleration up to maximum speed.
h) Noise, vibration, and temperatures of motor and bearings.

PSME.5 SITE TESTING OF PUMPING PLANT

On completion of the erection of the pumps and of rendering them operational, the Contractor shall make suitable arrangements to test them in the presence of the Engineer

Each pump shall be tested individually over its whole range of delivery. Where pumps are to operate in parallel, tests shall also be carried out to check these operating conditions.

The rate of delivery during testing shall be determined by cutting off the flow to or from the sump or reservoir concerned and timing the drop or rise in water level therein as applicable.

During tests, the average values of voltage and current drawn by the motor shall be noted and recorded. Motor efficiencies and power factors shall be used as supplied by the maker.

The test results shall be compared with the tendered pump characteristics, and the following tolerances will be allowed:

Delivery rate	0 + 10%
Overall efficiency	-5%

In the event of the pumps fai1ing to achieve the tendered performance in regard to discharge or efficiency within the tolerance allowed, then the Employer shall have the right to reject the pumps to recover all monies paid to the Contractor under the Contract for such pumps and to confiscate the surety by way of agreed and liquidated damages, whereupon the Contractor at his own expense shall remove all rejected plant where ordered to do so by the Engineer. Alternatively, the Engineer shall have the right to negotiate with the Contractor a reduction in the price of the pumping plant based on the increased power consumption over a twelve (12) year life.

PSME.6 CONTROL OF PUMPS

The control of each pump is described below under the particular requirements of each pump, but all control and switchgear will be supplied and installed by a separate (electrical) contractor to meet the requirements of the mechanical contractor.

PSME.7 ELECTRICAL INSTALLATION

The control of each pump is described below under the particular requirements of each pump, but all control and switchgear will be supplied and installed by a separate (electrical) contractor to meet the requirements of the mechanical contractor.

PSME.8 CORROSION PROTECTION

All mild steel components shall be thoroughly cleaned by grit blasting and coated with a polyamide-cured epoxy system similar or equal to Copon EP2300 or Amercoat 385.

PSME.9 CHARACTERISTIC CURVES FOR PUMPS

The Tenderer shall submit the following characteristic curves of performance of the pumps offered.

Pump (1) head - quantity curve
(2) efficiency curve

Motor (1) efficiency curve
(2) power factor curve

PSME.10 **SUBMERSIBLE PUMPS**

The pumps shall be of the submersible type with open impellers, preferably recessed, and shall be so designed as to allow the passage of solids, the size of which shall be 50 mm. Pumps with screw/centrifugal impellers and pumps fitted with cutters shall not be accepted.

Pump casings, impellers, and guides shall be made of high-grade cast iron, and the shaft shall be made of high tensile steel with suitable protecting sleeves. Bearings shall be waterproof and with suitable provisions for proper lubrication. The rotating assembly shall be properly balanced so as not to give rise to end thrust, or alternatively, suitable thrust bearings shall be provided. All parts shall be of ample dimensions and strength, properly machined and assembled to ensure perfectly free-running.

The pumps shall be capable of doing the required duty at a speed not exceeding 1 450 r.p.m. and shall be of the self-regulation type; the power curve being such that with an increase in rate of delivery beyond a certain figure, the power demand shall decrease, thereby protecting the electrical motor from overloading in the event of a burst occurring in the rising main, etc. The electric motors shall be sized to cope with the maximum power requirement of the associated pumps.

The pumps shall be provided with underwater quick-release pressure couplings, suitable stainless steel vertical guide rails, and a block-and-tackle for lowering and raising the pumps. Flexible hoses with above-water couplings shall not be accepted.

Performance particulars and characteristic curves shall be submitted at the time of tendering. Pumps shall be selected such that the closed valve pressure is at least 25% higher than the maximum head in the pump's operating range, and the rated duty point shall preferably be to the left of the peak efficiency point on the characteristic head-capacity curve for the impeller diameter proposed.

The motors shall be sized to cope with the maximum power requirements of the pumps plus an additional 15% allowance.

PSME.11 **INCLINED AXIAL FLOW (PROPELLOR) TYPE PUMPS (WOLWAS PUMPS)**

No specification is provided as there are limited local suppliers of these pumps.

However, the pumps shall be of the maker's standard and approved design, low maintenance, and robust.

The pumps shall be similar or equal to the Tsunami range for which the local agent is Franklin Electric.

PSME.12 **LIFTING GEAR FOR PUMPS**
PSME.12.1 **SUBMERSIBLES PUMPS**

Submersible pumps shall be supplied with guide rails for the easy removal of the unit. The guide rails shall be manufactured in grade 304 stainless steel, and all the equipment shall be corrosion-proof. The pump shall be firmly fixed to the rails such that no vibration or whipping of the pump will take place.

Full details of the guide rails and lifting gear shall be provided with the tender. Flexible delivery pipes will not be considered.

The Tenderer shall further provide ONE lifting rig (travelling trolleys and blocks, and tackle) for the wash water recovery (submersible) pump installation, as detailed on the drawings.

The crawl beam for the lifting gear (160 x 82 x 12.31 kg/m) will be supplied and installed under the Civil Contract, but the Contractor under this Section of the Contract shall supply and install a suitable manually operated lifting gear. Full details of the lifting gear shall be provided with the tender. A vertical distance of 5 000 mm from the crawl beam to the bottom of the sump shall be allowed for.

The total installation must, in all respects, comply with the Machinery and Occupational Safety Act and be to the satisfaction of the Engineer

PSME.12.2 **WOLWAS PUMPS**

No lifting equipment is required.

PSME.12.3 **RAW WATER PUMPS**

No lifting equipment is required.

PSME.12.4 **CLEAR WATER PUMPS**

No lifting equipment is required

PSME.13 **PARTICULAR REQUIREMENTS OF PUMPS**

(a) Wolwas Pumps

Currently, two inclined axial flow pumps pump raw water from the Rietfontein Dam to the Wolwas 1 Dam. The pump station is located approximately 1 kilometre from the dam wall and is accessible by vehicle via the R709 and dirt roads, a total distance of 7 kilometres from the Water Treatment Works.

Raw water is lifted from a sump by a 400 mm diameter inclined axial flow turbine approximately 6 000 mm long, through a vertical height of between 3 000 and 4 500 mm depending on the water level in the dam. At the upper end of the turbine, water is discharged into a 400 mm diameter underground pipeline that transfers the flow to an inlet box located on the embankment of Wolwas Dam No.1. The vertical distance between the inlet and outlet of this pipe is approximately 5 000 mm, and the length is 20 metres. It is assumed that the turbine has three stages and is fitted with six-blade propellers. Each of the existing pumps is driven by a 45 kW six-pole motor. It is estimated that the delivery of each of the existing

pumps is in the order of 300 l/s. The above details of the existing pumps are given in good faith, and tenderers will have to confirm the information when tendering.

The pumps are currently not operational and can probably not be repaired. Two new pumps will therefore have to be provided, each with an estimated delivery of 300 l/s, with the current configuration. The existing 45 kW motor size should preferably not be exceeded in order not to modify the existing bulk power supply system.

The pumps to be provided should be 400 mm in diameter, have three stages with six-blade impellers, and will be equipped with 45 kW, 6-pole motors. The new turbines should be connected to the existing underground delivery pipes, which will be retained.

Tenderers are requested to submit tenders on similar pumps to the existing pumps as their main offer. Alternative offers for submersible or self-priming centrifugal pumps will be considered, but offers should include full details of additional pipework, pressure gauges, valves, and non-return valves.

The electrical control system and cabling will be supplied under the electrical section of the contract.

(b) Raw Water Pumps

Originally, two centrifugal pumps, one acting as a standby to the other, pumped raw water from the Wolwas Dams to the inlet of the Water Treatment Works through a 150 mm diameter Asbestos Cement Class 12 pipe, approximately 370 metres long. The pumps are located in an existing pump station inside the existing dam wall.

Only one of the two pumps is currently installed, is in a poor condition and has to be replaced, together with a second new pump. The pipework is in a poor condition and will have to be replaced, complete with new valves and non-return valves. The general arrangement of the existing pumps and pipework is shown on Dwg

No details are available regarding the existing pump, except that it is equipped with a 22 kW motor.

The required duties of the new pumps have therefore been calculated, taking into account the existing suction and delivery pipework. It is estimated that the duty point of the new pumps should be 33 l/s at a head of 27 metres when one pump is operating on its own. The pumps shall furthermore be capable of operating satisfactorily anywhere between the total system curves obtained when plotting the information in the table below.

Flow (1/s)	Minimum Head (m)	Maximum Head (m)
0	2.5	8.5
5	2.9	8.9
10	4.2	10.2
15	6.4	12.4
20	9.5	15.5
25	13.4	19.4

30	18.2	24.2
35	23.9	29.9
40	30.5	36.5
45	37.9	43.9
50	46.2	52.2

The electrical control system and cabling will be supplied under the electrical section of the contract.

(c) Clear Water Pumps

Currently, two centrifugal pumps, one acting as a standby to the other, pump clear water from the treatment plant to three reservoirs located to the east of Winburg town through a 315 mm diameter uPVC Class 12 pipe, approximately 5 500 metres long. The pumps are located inside the existing filter building.

The existing pumps are in fair to poor condition and have to be replaced with the same or similar pumps. The pipework is in fair to good condition and only minor maintenance work will be carried out on the pipework. The general arrangement of the existing pumps and pipework is shown on Dwg.

The existing pumps are KSB WKLn 125/4 with 320 mm diameter impellers, fitted with 110 kW 4 pole (1 450 r.p.m.) motors. It is estimated that the duty point of the new pumps should be 55 l/s at a head of 126 metres when operating on its own. The pumps shall furthermore be capable of operating satisfactorily anywhere between the total system curves obtained when plotting the information in the table below.

Flow (l/s)	Minimum Head (m)	Maximum Head (m)
0	103.3	109.3
10	103.8	109.8
20	105.2	111.2
30	107.7	113.7
40	111.1	117.1
50	115.4	121.4
60	120.8	126.8
70	127.1	133.1
80	134.4	140.4
90	142.6	148.6
100	151.8	157.8

It is preferred that the pumps offered are KSB WKLn 125/4 pumps with 320 mm diameter impellers and 110 kW 4 pole motors in order that the existing pipework does not have to be modified. Alternative pumps will be considered, but tenderers must first price the KSB pumps

as their main offer and price any other pumps as an alternative. The cost of modifying the existing pipework will be deemed to be included in the alternative offer.

The electrical control system and cabling will be supplied under the electrical section of the contract.

(d) Washwater recovery pumps

TWO new submersible centrifugal pumps, one acting as a standby for the other, are required to pump wash water overflow from the sludge dams to the head of the plant. The pumps will be installed in a new pump station to be constructed under the civil section of the contract. The general arrangements of the pumps are shown on Drawing. The pumps shall each be selected to deliver 4 l/s at a system head of 12 m and shall furthermore be capable of operating satisfactorily anywhere between the total system curves obtained when plotting the information in the table below. The pumps shall be fitted with impellers capable of pumping sludge dam supernatant containing some water works sludge. The pumps will discharge into a 90 mm diameter uPVC Class 9 rising main as shown on the drawings.

The diameter of the pipework inside the pump-station shall be as shown in the drawings.

The control of the pumps will form part of a separate electrical section of the contract. A 6 metre long electrical cable will be provided with each pump.

Flow (Els)	Minimum Head (m)	Maximum Head (m)
0	10.0	12.0
1	10.0	12.1
2	10.2	12.3
3	10.4	12.6
4	10.7	13.2
5	11.1	13.8
6	11.6	14.6
7	12.2	15.5
8	12.9	16.6
9	13.6	13.9
10	14.5	19.2

PSMF CLARI-FLOCCULATOR EQUIPMENT

PSMF.1 SCOPE

This section of the Contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjustment, handing over in complete working order and upholding during the Defects Liability Period of

a) ONE new paddle mixer
b) Refurbishment of ONE existing paddle mixer
c) Refurbishment of the rotating bridge drive
d) New electrical panel for two paddle mixers and bridge drive

e) ONE knife gate valve with an electric actuator
f) New electrical panel for the knife gate valve actuator
g) Minor refurbishment of existing rotating bridge assembly and scrapers
h) Additional miscellaneous equipment

PSMF.2 PADDLE MIXERS

PSMF 2.1 GENERAL

Currently, the existing Clari-flocculator has been equipped with a single paddle mixer, complete with a motor and speed reducer in the flocculation zone. To ensure better mixing, it is necessary to install a second, similar paddle mixer on the opposite side of the flocculation zone. The existing flocculation zone has an approximate diameter of 5.0 metres, a depth of 3.2 metres, with a total volume of 63 m^3. Under the design flow rate of 100 m^2/h, the retention time is 38 minutes. The existing mixer will be inspected by the successful tenderer, and the required refurbishment will be assessed. Tenderers shall price for the replacement of the motor and speed reducer and the retention of the existing mixer paddles.

It will be necessary to extend the existing bridge in order to accommodate the new paddle mixer, and this work will be included in the cost of the mixer.

PSMF 2.2 DUTIES OF THE PADDLE MIXERS

The installed power of each of the paddle mixers shall be 0.55 kW. The tenderer shall select the mixers and paddles so that both mixers together shall maintain a velocity gradient of 45 s^{-1}

The tenderer shall supply all relevant information for the proper adjudication of the units, giving information regarding the type of impeller, size and shape, tip speed, the pattern of flow in the basin, shaft length and diameter, as well as construction.

PSMF 2.3 SPEED REDUCERS

Both the existing and new mixers shall be provided with speed reducers and variable speed drives (or two-speed motors), allowing them to operate at a rotating speed of 10 or 20 r.p.m. The two mixers shall rotate in opposite directions.

Speed Reducers shall be selected for continuous operation of 24 hours per day. Mechanical power ratings (according to AGMA) shall be greater than twice the installed power. Thermal power ratings shall be based on an ambient temperature of 40 °C.

Speed reducers shall be units specially designed to accommodate bending caused by the long overhang of the shaft of the mixer. Bending of the shaft shall not damage the driving gears or the bearings. Worm gears will not be considered, and all gears and pinions must be hardened and ground after cutting.

Tenderers will be required to provide a catalogue of the make of speed reducer offered and to indicate how the selection was made. All bearings shall be designed for a life of at least 100 000 hours at a B10 rating. Proof of such rating shall accompany the tender. In addition, the bearings on the output shaft shall be capable of withstanding the resultant forces caused

by the combination of radial and axial loads (imposed by the aerator) acting simultaneously, and shall be selected such that the following condition is complied with:

$$\frac{\text{actual radial load}}{\text{permissible radial load}} + \frac{\text{actual axial load}}{\text{permissible axial load}}$$

(where the "permissible" loads are the manufacturer's figures for 5 000 hours at a B10 rating). Tenderers shall indicate what these forces are and how they are accommodated.

Casings shall be made of close-grained cast iron and shall be designed such as to prevent moisture from entering. A dry well for the output shaft lower bearing is required.

Each speed reducer shall be fitted with a nameplate showing at least the following information:

(i) Speed reducer type or model number
(ii) Serial number
(iii) AGMA rating
(iv) Nominal ratio
(v) Approximate oil quantity required

PSMF 2.4 **MATERIALS**

The paddles and shaft shall be manufactured in mild steel.

All mild steel components shall be thoroughly cleaned by grit blasting and coated with a polyamide-cured epoxy system similar to or equal to Copon EP2300 or Amercoat 385 to a total dry film thickness of at least 400 microns. After installation, it shall be coated with a polyurethane enamel paint to a further dry thickness of 60 microns.

PSMF 2.5 **ELECTRICAL INSTALLATION**

The supply and installation of an approved weatherproof electrical panel to control the two paddle mixers, complete with all cabling between the motors and the panel, shall be provided under this section of the contract. The panel shall be mounted at the end of the bridge and shall also contain the electrical equipment to control the bridge drive motor.

PSMF 3 **KNIFE-GATE VALVE AND ACTUATOR**

PSMF 3.2 **TYPE OF VALVE**

The valve shall be a light-duty wafer-style knife-gate valve suitable for bi-directional flow The valve shall be of robust construction and of slim, light-weight design. The design shall ensure leak-proof sealing against the ingress of sludge.

Built-in scrapers must be provided to keep the blade clean on both sides during operation. The valve bore shall have a straight-through passage and internal body contours shall ensure that deposits are flushed out during valve operation. The valve body shall be of cast-iron and the blade of 316 stainless steel. The valve shall be installed with the operating spindle vertical. The required length of the spindle will be approximately 3 000 mm, but the exact dimensions will have to be confirmed on site

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PSMF 3.3 **ELECTRIC ACTUATOR**

The electric actuator shall consist of a motor-driven worm gear acting on the valve spindle. The motor and drive-gear shall be integrated in an enclosed housing. The enclosure shall be watertight, and terminals shall be housed in a separately sealed box. The motor shall be designed for valve operation with suitable torque characteristics and shall comply with the requirements of clause PMA.4.2 of this document.

The actuator shall be provided with 3-way OPEN/STOP/CLOSE pushbuttons and pad-lockable LOCAL/OFF/REMOTE selector switch, as well as torque and limit switches for end position signalling and interlock purposes.

Hand-wheel operation shall! be effected by means of an independent manual drive which shall be engaged by a two-position lever for HAND and AUTO operation. In the HAND position, the lever shall declutch the output shaft from the motor-driven worm wheel, before the hand wheel can be operated, with an electrical interlock to prevent the motor from starting. The declutch lever shall be padlockable in the HAND position to prevent motor-driven operation and in the AUTO position to prevent manual operation of the hand wheel.

PSMF 3.4 **ELECTRICAL INSTALLATION AND CONTROL**

The supply and installation of an approved weatherproof electrical panel to control the actuator, complete with all cabling between the motor and the panel, shall be provided under this section of the contract.

The valve will be controlled by means of a timer.

The panel shall be wall-mounted on the outside of the valve box approximately 1 500 mm above ground level.

PSMF 4 **CLARI-FLOCCULATOR BRIDGE AND SCRAPERS**
PSMF 4.2 **SCRAPER MECHANISM**

Only minor refurbishment is foreseen and will include the replacement of the rubber scrapers and on-site repair of the corrosion protection in badly corroded areas.

PSMF 4.3 **SPEED REDUCERS**

Speed reducers shall be selected for continuous operation 24 hours per day. Mechanical power ratings (according to AGMA) shall be greater than twice the installed power. Thermal power ratings shall be based on an ambient temperature of 40° C.

Tenderers will be required to provide a catalogue of the make of speed reducer offered and to indicate how the selection was made.

All gears and pinions shall be hardened and ground after cutting. Worm gears will not be considered.
All bearings shall be designed for a life of at least 100 000 hours at a B10 rating.

Casings shall be made of close-grained cast iron and shall be designed such as to prevent moisture from entering.

PSMF 4.4 **ELECTRICAL INSTALLATION**

The supply and installation of the electrical control equipment, complete with all cabling between the motor and the electrical panel, shall be provided under this section of the contract. The control equipment shall be housed in the same panel that houses the paddle mixer control equipment.

PSMG: **CHLORINATION EQUIPMENT**

PSMG.1 **SCOPE DUTY**

This section of the contract covers the supply, delivery, transport, handling, storage, erection, installation, commissioning, testing, adjusting, handing over in complete working order, and upholding during the Defects Liability Period of the following chlorination equipment:

The installation shall comply with the requirements of SANS 0298. The general arrangement of the system is shown on the Drawings

PSMG.2 **DUTY**

The chlorinator shall be capable of introducing gaseous chlorine in solution at two dosing points up to the maximum rates as listed below:

- Dosing point 1

Maximum rate of 2 mg/l to a maximum flow of 45 l/s, i.e. a maximum rate of 0.324 kg chlorine per hour.

- Dosing point 2

Maximum rate of 2 mg// to a maximum flow of 45 //s, i.e. a maximum rate of 0.324 kg chlorine per hour.

Accurate dosing to one tenth of the required maximum must also be possible.

The plant is required to administer chlorine at a manually set rate. The dosing equipment shall be calibrated in grams per hour.

The chlorine shall be dosed at the inlet of the existing clear water sump (Dosing point 1) and the pre-chlorination dosing point at the existing elevated inlet channel (Dosing point 2) with a sparge manifold/ diffuser. Dosing point 1 will be approximately 30 meters away from the chlorination building, and dosing point 2 will be approximately 20 meters away.

PSMG.3 **TYPE OF EQUIPMENT**

The equipment shall be of the solution feed vacuum type and shall comprise the following:

a) TWO vacuum gas regulators suitable for 68 kg chlorine cylinders;
b) ONE automatic changeover for the above;
c) TWO chlorine control valves;
d) TWO Injectors;

e) TWO weighing apparatuses (load cells) for 68kg chlorine cylinders;
f) THREE chlorination booster pumps (two duty, one standby) (surface type centrifugal);
g) TWO low-level fans (one for the chlorine store and one for the chlorination room);
h) Complete heating systems to prevent freezing of the gas
i) TWO full face gas masks with canisters,
j) ONE chlorine gas leak detector;
k) ALL interconnecting pipework;
a. TWO emergency cylinder shut-off systems;
l) Safety equipment and signs as specified;
m) ONE wind direction indicator;

The chlorinators shall be supplied complete with electrically driven pumping sets to furnish the necessary motive water which shall be obtained from the existing clear water sump. There shall be three pumps feeding motive water to the chlorinators. One pump shall be on duty for each dosing point, with one pump on standby. The pumps shall be located in the existing clear water pump station, approximately 30 meters away from the chlorination building. The booster pumps will be installed on new pump plinths on the floor of the existing clear water pump station at a level of 1 370.500m. The water level in the clear water sump will vary between a level of 1 370.500m and 1 372.000. The chlorination building floor level will be at a level of 1 373.000 while the level of the raw water inlet channel will be at a level of 1 377.850.

The motive water supply to the injectors shall be complete, including all isolation valves as indicated in the Tender Drawings and all pipework between the clear water sump, dosing points, and the chlorination building. API interconnecting pipework between structures shall have a minimum ground cover of 800mm The injector pump suction and delivery pipework to the chlorination room, and from the chlorination room to the two dosing points, shall be supplied and installed under this Section of the Contract. The suction pipe through the wall of the clear water sump shall be of 304 stainless steel with a puddle flange in the middle of the wall. All other pipework shall be made from PVC

The ON/OFF state of the chlorination system must further be controlled with the ON/OFF state of raw water entering the plant. ON, at flow entering the plant and OFF, when no flow is enteri•9 the plant.

The chlorine booster pumps shall have an emergency low-level off control if the water in the clear water sump drops to below a predetermined level of 1 370.500m

PSMG.4 CHLORINE GAS LEAKAGE DETECTION SYSTEM

A chlorine gas leakage detection system comprising the following shall be provided by the Contractor:

a) One measuring amplifier,

b) One amperometric gas sensor in each of the chlorine store and chlorination rooms;

c) One warning signal with a rotating flashlight and an audible alarm installed above the door to the chlorination room. The audible alarm shall further operate on a timer with an initial 20-second alarm. After a period of 5 minutes, after which a gas leak is still detectable, the 20-second alarm shall repeat;

d) Two off electric extraction fans capable of a flow rate of one cubic metre per second, installed 800 mm above the floor level. One fan is installed in each of the chlorine store and the chlorination room. The fans shall each be provided with an automatic louvre shutter system with positive shutdown. The fans must be automatically controlled with a manual bypass situated on the outside of the chlorination room. The automatic control must be interlinked with the chlorine leak detector and the entrance doors to each room. The motor of the fans shall be mounted on the outside, i.e., away from the wall.

PSMG.5 **WEIGHING APPARATUS**

Chlorine gas will be delivered in 68 kg cylinders, and they will be installed on two 68 kg load cells. The load cells shall be equipped with local indicators with read-outs in 500g divisions. The Contractor under this section of the Contract shall supply and install the load cells.

PSMG.6 **LIFTING GEAR**

No lifting gear is required.

PSMG.7 **SAFETY AND WARNING SIGNS**

The applicable National Occupational Safety Association (NOSA) signs and emergency procedures, as well as South African Chlor-Alkali Manufacturers' Association (SACAMA) wall charts, shall be appropriately displayed. (This shall include a first-aid information sheet for chlorine-gas poisoning).

Appropriate signage indicating that lone entry into the chlorine room is inadvisable while containers are being changed or when leaks are detected shall be appropriately displayed.

PSMG.8 **WIND DARE CTION INDICATOR**

A GRP wind direction indicator shall be fitted on a 5m high 100mm diameter galvanised steel post, near the chlorine store and chlorination building

PSMG.9 **HEATING**

The complete chlorination installation shall be provided with an efficient heating system to prevent freezing of the gas and ensure effective dosing conditions at all times.

PSMG.10 **EMERGENCY SHUT-OFF SYSTEM**

An emergency shut-off system, preferably electrically driven, shall be provided for each gas cylinder. The system shall be interlinked with the gas leak detector and shall close both tanks in the event of a gas leak. Details of the proposed system shall be included in the tender.

PSMG.11 DIFFUSERS SPARGE MANIFOLD

Tenderers shall provide and install one chlorine diffuser at the inlet of the clear water sump (Dosing point 1) and one diffuser at the existing elevated inlet channel (Dosing point 2). The diffusers are to be mounted at the bottom of the channels. The diffusers shall be readily removable and shall be fully described by the Tenderer.

PSMG.12 MISCELLANEOUS EQUIPMENT

The contractor shall supply the following additional equipment to the Employer:

a) One spare metering tube for 0 - 0.1 kg/hr.
b) One spare metering tube for 0 -0.25 kg/hr.
c) One spare metering tube for 0 - D.5 kg/hr.
d) Two (2) disposable chemical suits, CPF2 for chlorine.
e) Two (2) spare flexible cylinder connection lines.
f) One (1) GRP box containing the following:
    (i) Fifty (50) spare leader washers.
    (ii) One (1) chlorine spanner
    (iii) One (1) ammonia testing kit.
    (iv) Two (2) sets of PVC gloves.
    (v) Two (2) full-face gas masks with three (3) replaceable canisters, suitable for use in a chlorine atmosphere,

PSMG.13 ELECTRICAL INSTALLATION

A level control, installed upstream of the flocculant dosing point, must control whether the VSD lime feeders and the flocculant dosing pumps and chlorine booster pumps can be started based on a flow or no flow signal. The powder feeders, flocculant dosing pumps, and chlorine booster pumps shall only operate when water is let into the works, and the sensor (level control) must therefore have separate start and stop levels. The provision of the level control and electrical panel forms part of this section of the contract.

PSMG.14 TESTING AND COMMISSIONING OF THE CHLORINATION PLANT

The whole plant shall be left in proper working order, with neat and finished appearance, and in first-class condition to the entire satisfaction of the Engineer.

The plant shall then be operated by the Contractor for at least 72 hours or such longer time as may be necessary in order to put all equipment into proper adjustment. He shall calibrate any equipment requiring calibration, using the water, chemicals, and power provided for in this Contract. The two chlorine cylinders will be supplied by others. Thereafter, he shall instruct and train the Employer's officials in the proper operation of the plant. This training

shall be done as and when ordered by the Engineer and shall be paid for on an hourly basis as provided in the Schedule of Prices.

Thereafter, if satisfactory in every respect, the plant shall be handed over to the Employer's officials and the 12 months' defects liability period shall commence.

PMA: **MECHANICAL INSTALLATIONS**

SECTION 1: GENERAL

PMA.1.1 **DATA TO BE SUPPLIED BY TENDERERS**

Full particulars of the material and equipment offered shall be submitted at the time of tendering, and all information requested shall be supplied on the information sheets in this contract document. Any additional information shall be given either in Annexure E or in a covering letter referred to in Annexure E, and all drawings, sketches, pamphlets, etc., shall be submitted with the tenders.

PMA.1.2 **PLANT DRAWINGS**

Within as short a time as possible, but not exceeding one (1) month of the placing of a contract, the Contractor shall supply the Engineer, in triplicate, with fully dimensioned drawings of the plant and equipment ordered from him and of the position and sizes of all foundations, bolt holes, openings in walls or floors and other special features, affecting construction of the works, so that the Engineer can arrange for the necessary concrete work, foundations, bolt holes, openings for pipes, cable ducts, etc., for the proper erection and installation of the plant.

Any cutting or alteration of structural work arising from inadequate or incorrect dimensions and particulars afforded by the Contractor, or through late receipt of such particulars, will be arranged by the Engineer to be carried out as he thinks fit at the expense of the Contractor concerned under this contract.

PMA.1.3 **PACKING**

All plant, equipment, apparatus, and pipe-work likely to be damaged in loading or unloading, or through chafing or through being subjected to pressure, or likely to deteriorate through exposure to the atmosphere, is to be suitably packed so as to prevent such damage.

PMA.1.4 **QUALITY OF MATERIAL AND ACCEPTANCE**

Any material and/or workmanship which is found to be unsound, damaged or contrary to the specification, or which is found during the defects liability period or during tests in situ to be defective, or in any way contrary to the specification due to causes within the Contractor's control and responsibility shall be rejected

All material rejected by the Engineer shall be replaced or repaired by the Contractor at his own expense to the instructions and satisfaction of the Engineer.

PMA.1.5 **TIME OF DELIVERY AND COMPLETION**

Tenderers are to state in the schedule of prices, the periods in which they undertake to effect complete delivery of all material under the contract from the date of placing the order. Tenderers are also to state the period in which they undertake to complete all erection, adjustment, putting into proper working order, and testing of all plant and material after receipt of the order from the Engineer to commence erection or after the date of final delivery of material, whichever is later.

PMA.1.6 **IMPORT PERMITS**

No special import permits will be available for the importation of materials under this contract. Tenderers shall tender therefore on the understanding that if they are awarded the contract, the materials will be supplied ex local stocks or that importation will be effected from their own permit quota.

Tenderers are to bear in mind that preference will be given, other things being generally equal, to tenders offering material of local manufacture.

PMA.1.7 **OPERATING AND MAINTENANCE MANUAL**

The Contractor shall prepare and supply manuals for the successful operation and maintenance of the installation. A draft of the manual shall be submitted after commissioning for approval. The draft shall then be corrected, if required, and three sets of the manual shall be submitted before the first acceptance of the plant will be taken.

These manuals shall contain the following information: Section 1: System description

A comprehensive description of the system, including schematic diagrams, is provided where required for clarification.

Section 2: Commissioning data

The results of all checks and measurements as recorded during the commissioning period shall be included and shall be compiled in such a manner that every check and measurement is clearly defined.

Section 3: Operating instructions
3.1 Pre-start checklist for each individual plant.
3.2 Starting and stopping instructions.
3.3 Plant running checklist.
3.4 Safety precautions to be taken.
3.5 Manual operation.
3.6 Operator's duties.

Section 4: Mechanical equipment
4.1 Description of all major items of equipment with the make, model number, names, addresses, and telephone numbers of the supplier, manufacturer, or their agents.

4.2 Design capacities of all equipment, including selection parameters, selection curves, capacity tables, etc.
4.3 Manufacturer's brochures and pamphlets.
4.4 Schedule of spares with part numbers recommended to be held in stock by the owner.
4.5 Pressure vessel (e.g., receiver) test certificates.

Section 5: Maintenance instructions
5.1 Schedule of maintenance particulars.
5.2 Part numbers of all replacement items.
5.3 Capacity curves of driven equipment.
5.4 Sizes, types and lengths of drive couplings.
5.5 Serial numbers of principal! pieces of equipment.

Section 6: Electrical equipment
The following information shall be provided for all electrical equipment, whether switchboard or field mounted.
6.1 Electrical equipment schedule with make, model number, rating, commissioning setting, and name, address, and telephone number of supplier.
6.2 Maintenance instructions.
6.3 Manufacturer's brochures and pamphlets.

Section 7: Instrumentation and control
7.1 Description of each individual control system.
7.2 Control equipment schedule with make, model number, rating, commissioning setting and name, address, and telephone number of supplier.
7.3 Manufacturer's brochures and pamphlets.
7.4 Maintenance instructions.

Section 8: Drawings
Paper prints or reduced-sized prints of all Contractor's drawings (mechanical and electrical) updated to "as built" drawings.

The contract will be considered incomplete until all tests have been conducted to the satisfaction of the Engineer and all drawings and manuals have been handed over to the Engineer

PMA.1.8 PROGRAMME OF WORK

In carrying out the erection, a definite scheme of operation shall be observed by the Contractor, and such scheme shall at all times be subject to the approval of the Engineer and be in accordance with his requirements.

The Engineer may, from time to time, by order in writing, without in any way invalidating the contract or giving to the Contractor any claim for additional payment, require the Contractor to proceed with the execution of the works in such order as in his opinion may be necessary, and may alter the order and suspend any part of the work at such time and times as he may deem desirable.

When the work must necessarily be carried out in conjunction with the work of other Contractors or with that of the Employer, it shall be coordinated and arranged in such a manner so as to interfere as little as possible with the progress of such other work, and so as to offer every reasonable facility to other Contractors or to departmental employees of the Employer.

PMA.1.9 **CONSTRUCTION WORK**

The erection and completion of the building work to house the plant and equipment will be carried out either departmentally or under separate contract in advance of the delivery of the plant. Holes will be left in walls and foundations to accommodate piping, foundation bolts, and other equipment to be erected under this contract, so that the Contractor will generally only be required to grout up these holes after the installation of the piping and equipment has been completed, unless specified otherwise in the project specifications.

PMA.1.10 **ERECTION, ADJUSTMENT, AND OPERATION**

The Contractor shall make his own arrangements for handling and transporting all material to the site of works in a proper and careful manner to avoid damage, and shall be responsible for properly storing and protecting all plant and equipment against damage by water, weather, fire and any other interference before and during erection.

This contract is to include for the erection, adjustment, putting into proper working order and upholding of all plant, equipment and materials supplied by the Contractor. The work of erection of the plant is to be carried out under a skilled and experienced erector and the plant, when erected, is to be of neat and workmanlike appearance, solidly and evenly supported, true to line and level, plumb and in proper working order. The erection is to include for the proper grouting in of all bolts, pipes, fittings and holes left by the building contractor for the reception of the equipment and pipes, as well as properly making good any damage to completed work, caused by the Contractor under this contract.

In the event of the Contractor not commencing erection when required by the Engineer, or his speed or quality of erection not being to the satisfaction of the Engineer, the Employer shall have the right to commence erection or to assist in or to complete erection with his own staff, or to engage another Contractor to do the work, in which case all expenditure so directly incurred by the Employer, plus the addition of twenty (20) percent thereon for administration and supervision will be debited to the Contractor and shall be recoverable from him in such manner as the Employer may elect.

On completion of erection, unless otherwise specified, the Contractor is to clean all exposed metalwork, polish parts to be left bright and paint all other parts, as instructed.

The Contractor is to finish off neatly all grouting and painting carried out by him and is generally to leave all his work under this contract clean, tidy and in an efficient working order.

After completion of erection, the Contractor is to operate his plant for at least seventy-two (72) hours or such longer time as may be necessary in order to put all equipment into proper adjustment and working order, using for this purpose the water and electricity provided free of charge by the Employer.

Before handing over the plant, the Contractor is to ensure that every part of the equipment is operating satisfactorily. The contract will not be considered complete until the Engineer is fully satisfied in this connection. In the event of the Contractor being unable to test and adjust the plant and equipment at the time of installation through circumstances beyond his control, it may be necessary for him to return to the site at a later date to undertake this work. An item has been provided in the schedule of prices to cover the cost of returning to the site, if ordered by the Engineer to do so, in order to carry out this work.

The completion date will be taken as the date on which the plant is commissioned or when all the tests specified have been completed to the satisfaction of the Engineer, whichever date is the later

SECTION 2 MATERIALS

PMA.2.1 STANDARD SPECIFICATIONS

References made hereinafter to specifications of the South African Bureau of Standards (SABS) or the British Standards Institution (BS) shall be deemed to include all the latest revisions of and/or additions to such specifications, where applicable.

PMA.2.2 MATERIALS GENERALLY

All materials used shall be of the best of their respective kinds and shall be suitable for working at the pressures and temperatures involved under all working conditions without deteriorating or distorting or setting up of undue stresses in any part. No welding, burning, filling or plugging of defective castings shall be permitted without the written approval of the Engineer.

PMA.2.3 CORROSION

Where corrosion of metal may be expected from contact with water or sewage or from any other cause, the Contractor shall supply materials that are resistant to corrosion. Any material showing signs of corrosion, tuberculation or pitting before expiry of the defects liability period shall be replaced by the Contractor at its own expense with materials to the Engineer's approval.

PMA.2.4 STRUCTURAL STEELWORK

All joists, angles, channels, plates and structural steel are to conform to BS 4369, Part 2.

PMA.2.5 PIPES AND FITTINGS

1. Galvanised screwed and socketed tubes
   All screwed and socketed pipes shall conform to SABS 62 so far as it may apply and if not amended by any other conditions in this contract. Pipes shall be medium class and galvanised.

2. Steel and malleable iron pipe fittings

Pipe fittings to be used in conjunction with screwed and socketed pipes shall, as far as applicable, comply with the appropriate requirements of BS 1387 and BS 143, and shall be galvanised.

3. Copper tubes
   All copper tubes shall conform to SABS 460 class 2, unless specified otherwise in the project specifications.

4. Cast iron pipes and fittings
   All cast iron pipe, fittings and specials shall conform to SABS 509
   Tenderers are at liberty to put forward any type of flexible coupling suitable for cast iron pipes, but must submit full particulars at the time of tendering.

5. Non-corrosive pipes and fittings
   Non-corrosive pipes and fittings shall be made of completely non-corrosive materials such as uPVC manufactured to SABS 966.

6. Steel pipes and fittings
   All steel pipes and fittings shall comply with the requirements of SABS 719, where applicable, and shall be made of steel plate of not less than 6 mm thickness, unless specified otherwise in the project specifications.

PMA.2.6 VALVES AND FITTINGS

1. Gate Valves
   Gate valves shall be double flanged waterworks pattern valves with non-rising spindles and shall comply with the requirements of SABS 664 - Figure 1 - Class 10, unless otherwise specified. All gate valves shall be fitted with hand wheels with the direction of closing, which shall be clockwise when viewed from above, indicated thereon. Valves shall be ductile iron with minimum 250 micron fusion bond epoxy powder coated internally and externally.

2. Resilient Seal Gate Valves
   Resilient Seal Gate valves shall be double flanged valves with non-rising spindles and shall comply with the requirements of SABS 664 - Figure 2 - Class 10, unless otherwise specified. All resilient seal gate valves shall be fitted with hand wheels with the direction of closing, which shall be clockwise when viewed from above, indicated thereon. Valves shall be ductile iron with minimum 250 micron fusion bond epoxy powder coated internally and externally.

3. Knife Gate Valves
   Knife gate Valves shall be double flanged (unless otherwise specified), having a rising spindle (unless otherwise specified). Bodies shall be manufactured from SG Iron. Valves shall have stainless steel grade 316 blades. Blades (knife) shall be surface ground to ensure absolutely flat and parallel faces. The valves shall have a body rating of 1000kPa for sizes 600mm and smaller, for sizes larger than 600mm the valves shall have a body rating of 1000kPa and must be suitable for the specified unbalanced pressure plus 10% minimum

Valves shall have blade scrapers fitted as a standard to prevent the ingress of media into the gland area. The values shall have internal guides to ensure that the body corrosion protection is not damaged by the sliding action of the blade. Valves shall be of the "pocketless" design and shall have an O-ring type blade seal to ensure drop-tight shut-off. The valves shall have an externally re-packable gland arrangement. Valves shall be operated by means of a Hand wheel, Gearbox or actuated in accordance with the requirements specified in DWS 2510. Valve body shall be ductile iron with minimum 250 micron fusion bond epoxy powder coated.

4. Butterfly Valves
   Butterfly Valves shall be flanged, double off-set disk, disk type to BS5155, with stainless steel body seat, stainless steel retaining rings with EPDM replaceable continuous moulded rubber 'T' section seal. Valves shall be ductile iron with minimum 250 micron fusion bond epoxy powder coated internally and externally. Butterfly valves shall further be provided with gearboxes that shall incorporate a mounting flange for possible future mounting of an electric actuator. The valves shall be supplied with hand wheels and the direction of closing of hand wheels shall be clockwise when viewed from above.

5. Swing Check Reflux Valves
   Swing Check Reflux Valves shall be flanged, single door swing type and shall be fitted with gun metal seats and bronze hinges and clack pins. Valves shall be rated PN10 unless otherwise specified. In the case of reflux valves to be mounted horizontally, the design shall be such that the gate rests against the seat in the absence of flow or of differential pressure, without the aid of a spring or external counterweights. Swing Check Reflux Valves shall comply with the requirements of SABS 1551-1, and the face-to-face dimensions shall be in accordance with Table 4 for alternative dimensions. Valve bodies and disks shall be ductile iron with a minimum 250 micron fusion bond epoxy powder coated internally and externally.

6. Slanted Seat Check Valves
   Slanted Seat Check Valves shall be double flanged, OZ-KAN or similar approved, offset disk type to DRN 3202 F4. Valve bodies and disks shall be ductile iron, 250 micron minimum fusion bond epoxy powder coated internally and externally. The valves shall have Stainless Steel weld deposited seats, ground, and micro-finished. The seal on the blade shall be an EPDM continuous moulded rubber 'T' section seal clamped between a Stainless Steel retainer ring

7. Silent Check Valve
   Silent Check Valves shall be double flanged, OZ-KAN or similar approved check valves with a stainless steel retaining ring with an EPDM replaceable seal. Valves shall be ductile iron with a minimum 250 micron fusion bond epoxy powder coated internally and externally.

8. Flanges
   Flanges shall comply with SABS specification 1123 and shall be drilled to the table 10, unless otherwise specified.

Flanges shall be machined flat, i.e., without a raised joint face. Before the machined surfaces have become affected by rust, they shall be coated with a mixture of white lead and tallow or other approved protective composition

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PMA.2.7 **JOINTING MATERIAL**

The scheduled prices shall include for all jointing material to complete the installation of the pipe work. In the case of flanged joints, this shall include bolts, nuts and rubber insertion rings, the latter complying with BS 2494, class E. The length of the bolts shall be such that when the joint is fully tightened up, two threads of the bolt shall be exposed. The diameter of the bolts shall comply with BS 4622.

PMA.2.8 **BOLTS, NUTS, AND WASHERS**

All bolts and nuts shall comply with the requirements of SANS 135 and shall be of grade 4.6 steel. Washers shall be provided at each nut and shall be of the same material (or coating where applicable) to match the bolt and nut. Nuts and bolts subject to vibration shall be machined, finished, fitted with plain washers and treated with "Loctite" or equivalent.

Bolts other than jacking bolts shall project not less than 3 mm and not more than 10 mm from the heads of the nuts after tightening.

All bolts to be built into concrete work as well as bolts to be installed above ground level (outside buildings), directly above and under water, shall all be of stainless steel grade 304. Bolts for flexible couplings and flanges for underground installation shall be hot-dip galvanized. Bolts to be installed inside buildings shall be hot-dip galvanized. Galvanizing shall be in accordance with

Clause 7 of the Standardized Corrosion Protection Specification (Heavy coating).

Suitable plastic sleeves and/or washers shall be used for protection against corrosion by metallic action.

The scheduled prices shall include for all jointing material to complete the installation of the pipe-work. In the case of flanged joints, this shall include bolts, nuts and rubber insertion rings, the latter complying with BS 2494, class E. The length of the bolts shall be such that when the joint is fully tightened up, two threads of the bolt shall be exposed. The diameter of the bolts shall comply with BS 4622.

PMA.2.9 **LUBRICANTS**

In addition to the lubricating oil to be provided for commissioning the plant, an additional quantity of oil adequate for at least 2 complete refills of such plant must also be provided.

A grease gun suitable for use in conjunction with all the grease nipples on the plant must be provided, together with at least 5 kg of the appropriate grease to be used. If more than one type of grease is required, a separate grease gun for each type of grease and 5 kg of each type of grease must be provided.

The prices tendered in the Schedule of Prices will be held to include for the supply of the additional lubricating oil, the grease gun and grease.

PMA.2.10 **LUBRICANTS**

In addition to the lubricating oil to be provided for commissioning the plant an additional quantity of oil adequate for at least 2 complete refills of such plant must also be provided.

A grease gun suitable for use in conjunction with all the grease nipples on the plant must be provided, together with at least 5 kg of the appropriate grease to be used. If more than one type of grease is required, a separate grease gun for each type of grease and 5 kg of each type of grease must be provided.

The prices tendered in the Schedule of Prices will be held to include for the supply of the additional lubricating oil, the grease gun and grease.

PMA.2.11 **HANDRAILING**

Stanchions for hand railing shall be of approved prefabricated ball type made in one piece without welding at ball joints to accept the hand and knee rails and shall have 150 x 75 x 10 mm baseplates drilled for M 12 bolts at 100 mm centres.

Hand and knee rails shall consist of 25 mm nominal inside diameter tubing cut and bent to shape. Stanchions shall be spaced not more than 1.5 meters apart. Unless otherwise shown, all hand railing shall be 900 mm above walkway level.

All tubing, stanchions and baseplates shall be manufactured in grade 304 stainless steel with a No.1 surface finish.

SECTION 3: PAINTING AND FINISHING

PMA.3.1 GENERAL

The following clauses shall apply to all items to be painted under this specification:

1. No paint will be applied unless the surface to be painted has been thoroughly cleaned to remove all traces of dust, grease, oil, mill scale, rust or corrosion of any nature.
2. All metal surfaces shall be moisture-dry before paint is applied. All paint surfaces shall be "hard" dry before a further coat may be applied, unless otherwise specified
3. AU surfaces that will be inaccessible after installation shall receive the specified application before installation
4. If the shop coat was left for a few months, the surface shall be rubbed down with emery paper or steel wool before final coats are applied. Washing down and scrubbing with clean water and a hard brush is recommended.
5. The painter shall satisfy himself that the final coat completely covers the previous coat.
6. The dry film thickness shall be measured using a non-destructive thickness gauge similar to MIKROT EST.
7. In all cases, the manufacturer's instructions must be strictly adhered to

PMA.3.2 **METAL PREPARATION**

1. All steel surfaces shall be sandblasted to a minimum of Sa. 2+/-(off-white) finish, to the Swedish specification S.I.S. 05/59/00.
2. The abrasive shall comply in all respects to SABS code 064 and shall be free of any traces of oil, grease, foreign objects or corrosive contaminants such as chlorides, etc.
3. The abrasive and blast cleaning shall be adjusted to ensure that the minimum amount of abrasive remains embedded in the steel.
4. Blast cleaning shall not be done when there is dew on the metal or in the case if nozzle blasting, when the atmospheric humidity is such that moisture condenses at the nozzle during work.
5. Blasted surfaces shall be brushed or cleaned by vacuum before painting. It is essential to apply the primary coat within the shortest possible time after blasting and certainly within four (4) hours.
6.

PMA.3.3 **PAINTING**

PMA.3.3.1 General

The ideal temperature for painting lies within the range 13 to 32 °C (55 to 90 °F). The steel surface should be clean and dry and the ambient relative humidity should be below 90 %. Painting should be suspended under the following conditions:

(a) When the temperature of the ambient atmosphere falls below 4 °C (40°F), or its relative humidity rises above 90 %. (It may be possible to paint satisfactorily outside under these conditions by erecting some form of temporary shelter.)
(b) For outdoor work, during periods of inclement weather, i.e., rain, snow, fog or mist.
(c) Generally, when the conditions are such that condensation has occurred or is likely to occur on the steel

Because of the possibility of condensation when cold material that is brought into a warm shop for painting after having stood in the open, ample time should be given to reach the ambient temperature, e.g., stand in the shop overnight before work is begun

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PMA.3.3.2 Preparing Paint for Use

Correct preparation of paint immediately before use is highly important.

All paints should be supplied from the stores and the painters, ready for application (with the exception of mixing). Any instructions given on the containers by the manufacturers should be strictly followed for example, any paint not used within its specified ”pot life" should be

discarded. No paint should be used after the expiry of the safe "shelf life" indicated on the container. The quantity of paint mixed at one time should be restricted according to its "pot life".

All paints should be thoroughly mixed under the supervision of the foreman in a manner approved by the project engineer. During the progress of the work, only the minimum number of containers needed should be open at any one time and partly full containers should be temporarily sealed.

PMA.3.3.3 Paint Application

A zinc-rich (epoxy) primer conforming to SABS 926, must be applied within four (4) hours after blast cleaning, to a dry film thickness of at least 15 microns. It is preferable that the primer be applied by brush.

After the fabrication, a coat of zinc-chromate or similar undercoat shall be applied, as described in the detailed specification. Prior to applying this coat, the painter shall ensure that the entire surface is free of contamination.

Final coats shall conform to the detailed specification set out hereunder.

When painting over blast cleaned surfaces which are unavoidably rough, if is essential that sufficient thickness of priming paint be applied to ensure that the high spots of the steel surface are adequately covered. Should inspection reveal that this is not the case, the number of priming coats should be increased accordingly.

Each coat should be allowed to become sufficiently cured before the next is applied. Unduly long curing periods may impair adhesion between successive coats and the interval between successive coats should not exceed two (2) days.

If the curing interval has been so long as to endanger the adhesion of the following coat, the paint already applied should be lightly rubbed down with fine abrasive paper before applying the next coat.

PMA.3.4 DETAIL PAINT SPECIFICATION

A. Ordinary Steelwork

Primers	One coat zinc-chromate plus one coat universal undercoat
Finishing coats	Two coats of gloss enamel of approved manufacture. Total film thickness 0,1 mm

B. Steelwork in sea environment Primer

Primers	One coat zinc-rich epoxy primer with dry film thickness of 15 microns
Undercoat	One zinc-chromate
Finishing coats	Two coats of micaceous iron oxide structural paint of different colours to a total film thickness of 38 microns per coat

C. Steel work in contact with water

Primers	One coat zinc-chromate plus one coat red-lead
undercoat	Two coats "Chemgard" undercoat or similar of different colours (Plascon ref no A.R.1)

Finishing coats Two coats "Chemgard" enamel or similar (Plascon ref no. A.R.6) with top coat light grey, unless otherwise specified
Film thickness of all "Chemgard" coats to be at least 25 microns.

D. Galvanized steel

All traces of protective coatings must be removed with an approved cleaning agent.

Primer	One coat of approved galvanising etching agent
Undercoat	One coat universal

Finishing coat	Two coats of approved gloss enamel

E. Cast iron

Remove as much as possible of the bitumen covering layer.

Primer	One coat aluminium-based paint
Undercoat	One coat universal undercoat
Finishing coat	Two coats of approved gloss enamel

F. Aluminium

Primer	One coat of approved etching agent
Further Coats	As D, and E. above

G. PVC

Primer	One coat of approved etching agent
Further Coats	As D, and E. above

PMA.3.5 GALVANISED

1. Surface treatment

The surface must be completely free from rust, dirt, grease, mill scale and any other contaminants and must in general, be cleaned to the same standards laid down in clause PMA.3.2 of the specification.

Further cleaning must be carried out by acid pickling. As soon as the product to be galvanised has been sufficiently cleaned and rinsed, a coating of flux must be applied

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2. Zinc coating

When hot-dip galvanizing, the composition of the steel, the zinc temperature, and the immersion items shall comply with the standards generally accepted for that type of item. All aspects of hot-dip galvanizing shall comply with the requirements of SABS 763. A coating of at least 765 g/m^2 must be achieved.

PMA.3.6 EPOXY COATING

1. Surface treatment

The surface must be completely free from rust, dirt, grease, mill scale, and any other contaminants and must in general, be cleaned to the same standards laid down in clause PMA.3.2 of the specification.

2. Epoxy coating

Epoxy coating of piping shall be done to the manufacturer's specification and shall be similar or equal to COPON KS 16 W. The epoxy coats shall be applied in layers of 40 to 60 µm to form a total thickness of 120 µm.

PMA.3.7 REPAIRS TO DAMAGED SURFACES

Damage to any previous paint coats should be made good by re-coating the affected areas in the same or in an equivalent manner to that originally specified. They should first be cleaned to bare metal if necessary, and the edges of the undamaged paint should then be

bevelled and sand papered. The patches of new paint shall overlap the old paint by at least 20 mm

SECTION 4: ELECTRICAL EQUIPMENT

PMA.4 **QUALITY SPECIFICATION**

PMA.4.1 **GENERAL**

This specification covers the general items of equipment for electrical installations. All materials and installation of such materials shall! comply with the following:

1. The latest edition of the "Code of Practice for Wiring of Premises" SABS 0142 by the SA Bureau of Standards.
2. The Occupational Health and Safety Act (Act 85 of 1993).
3. The Local Supply Authority's Regulations and Fire Insurance Regulations.
4. Any special conditions implied in this specification.

PMA.4.2 **MOTORS**

Motors shall comply with BS 5000: Part 99 and be dimensioned to SABS 948 and be suitable for 400/230 volt, 3 phase, 50 cycle A.C. supply, and shall be continuously rated for operation at the required altitude. The anticipated number of starts per hour must be taken into consideration when determining the motor size.

The installed power of the motors shall exceed the calculated absorbed power by at least 15%.

The motor speed shall preferably not exceed 1 450 r.p.m. and should suit the speed of the plant offered.

The motors shall be of the approved squirrel cage type with a low starting current and, whenever possible, be directly coupled to the rumps either by horizontal or vertical spindles

AU motors shall have class B insulation and be of the totally enclosed fan-cooled (TEFC) type, suitable to be use in wet environments. Submersible pump motors shall be protected against wet running due to seal failure by means of moisture-sensing probes in the oil chambers.

Non-submersible motors rated at 11 kW and higher shall be protected against overheating by thermistors embedded in the motor windings. These devices shall trip the power supply to the motor as soon as the temperature in the windings exceeds safe levels. This will apply to submersible motors of 30 kW and higher. The thermistor temperature rating must be compatible with the temperature rating of the motor insulation class.

Motors shall be able to start satisfactorily at a voltage of 10% below nominal voltage, as measured immediately after the starter is switched on. Motors shall be run up to full speed in the time given in Appendix E of BSS 587 with the voltage reduced to 10% as above. Acceleration shall be smooth throughout the starting period with no signs of hesitation or "crawling"

The motors shall be provided with approved watertight cable glands to accommodate the cables to be supplied with the equipment.

On completion of the manufacturer's work, all motors shall be subjected to routine and type tests in accordance with BS 2613, and test certificates shall be submitted for approval before delivery to the site is undertaken. After installation at the site, the Contractor shall carry out, in the presence of the Engineer, the high voltage tests laid down in clause 33 of BS 2613.

Tenderers shall supply efficiency, power factor, and starting current curves of the motors at the time of tendering.

PMA.4.3 STARTERS

Unless specified to the contrary in the Project Specification, starters must conform to the requirements as set out below. The following requirements will also be applicable to soft starters in PMA.4.4

PMA.4.3.1 Starter Types

The following starter types must be used for the motor ratings indicated, and the duty rating must be AC3.

Up to and including 4 kW	Direct on line Over 4 kW to 40 kW Star delta
Over 40 kW to 110 kW	Series reactor (Starting current must be limited to 3 x FLC)
Over 110 kW	As per project specification

PMA.4.3.2 Starter Requirements

Should the starter type, duty or torque characteristics specified not be suitable for the application of the tendered equipment, a suitable starter must be offered as an alternative in the Annexure together with price implication and full particulars similar to those required in the information sheets.

Starters shall be rated for not less than 15 starts per hour and consist of the following:

a) Circuit breaker with padlockable handle;
b) CT operated ampere meter;
c) 6-digit running hour meter,
d) Contactors and current limiting devices in accordance with the motor starting requirements;
e) Protection devices which shall be provided as follows;

Motor overload relay with adjustable thermal trips and single phasing protection;

(i) Winding overheat protection in accordance with the type of temperature-sensing devices in the motor. In the case of thermistor relays, it must be ensured that the thermistor resistance curve and the thermistor relay tripping characteristics are compatible.
(ii) Earth leakage protection as required by SABS 0142, e.g., for motors liable to flooding. Earth leakage protection shall be provided for submersible motors,

irrespective.

(iii) Earth leakage relays shall be purpose-made, similar to the E.P.C. manufacture;

(iv) Protection equipment for moisture-sensing probes (submersible motors only)

All protection devices must trip the associated motor and individual fault indication must be given by means of a red pilot light. Flush-mounted push buttons must be provided for resetting the protection equipment.

f) Control devices which shall be provided as follows:

i) Manual starting and stopping must be provided by means of a green and red push button, respectively. Automatic starting must be provided in accordance with the project specification requirements.

A green pilot light operated by the motor "RUN" contactor must be provided to indicate when the motor is running.

ii) Starters used in conjunction with automatic starting and stopping equipment shall be fitted with a red mushroom-head stop-lock: type emergency stop, which must also be operative in manual mode;

iii) A lamp test push button must be provided, which will switch on all pilot lights simultaneously when operated.

iv) The motor circuit breaker (with auxiliary switches as required) shall disconnect all power and control connections to the motor served. It shall, however,

v) be possible to test the control circuit (applicable to motors 15 kW and higher only) without switching the motor (i.e., the motor circuit breaker off) by means of a selector switch inside the panel marked normal/test.

The control circuit voltage must be taken from the load side of the motor circuit breaker (normal position) and from the live side (test position), via this changeover switch. The test position must be interlocked with an auxiliary switch on the motor circuit breaker, so that the test line will be disconnected when the motor is on
For example, it shall not be possible to start the motor with the motor circuit breaker on and the c/o facility in test

PMA.4.3.3 General

Facilities must be provided in the factory to test starters and all protection equipment.

The starters shall be fitted with approved terminals of ample dimensions to suit the cables to be supplied from this equipment. The terminals must be installed directly above the gland plate for the outgoing cables.

An approved earth terminal shall be provided on the frame of each starter housing gear and provision shall be made for earthing each starter.

PMA.4.4 **ELECTRONIC (SOFT) STARTERS**

PMA.4.4.1 General

The general requirements as per PMA.4.3 will be applicable, as the starter in this section refers to the electronic module.

Soft starters must provide smooth acceleration during run-up, reducing voltage drop, current and torque peaks, by means of reduced voltage at start-up, which is increased to full value on an adjustable time ramp, with an adjustable maximum motor current limit.

They must be in accordance with the type(s) specified in the project specification and must conform to the following minimum requirements

PMA.4.4.2 Application

Soft starters will in general, be specified for purposes of torque control rather than current limit. The reduced voltage at start-up and the degree of current limit (if specified) may reduce starting torque considerably. Tenderers must ensure that the starter and conditions specified, comply with the requirements of the driven machinery offered and should qualify their tender, including financial implications, accordingly.

Any financial implication arising due to non-compliance with this stipulation will be borne by the Tenderer.

The motor and starter combination must be carefully selected to ensure compatibility of the torque requirements and motor insulation class for the operating cycle and starter to prevent thermal tripping of the starter due to overheating of the motor (prolonged starting times).

PMA.4.4.3 Technical Characteristics

The following (minimum) requirements and facilities listed must be provided.

PMA.4.4.3.1 Technology

The unit must consist of a microprocessor-controlled control unit and a power unit with 3 banks of 2 thyristor modules back to back with protection devices and gamma firing angle control.

PMA.4.4.3.2 Climatic operating conditions

a) Ambient temperature
b) Humidity

PMA.4.4.3.3 Standards

a) Vibration resistance : to IEC 68-2-6
b) Shock resistance : to IEC 68-2-27
c) Radio electrical interference : to IEC 801-3

PMA.4.4.3.4 Supply

400 V 3 phase -15 %, +10 o/ at 50 Hz.

PMA.4.4.3.5 Rating

The starter must be suitable for the continuous rated motor connected load plus 10 % and 12 starts per hour, for single motors (refer to 6.0 for multiple motor starting). This is a minimum requirement and the application as per 2.0 must be taken into account with the selection.

PMA.4.4.3.6 Control functions

a) Starting
   i) Voltage ramp (starting acceleration) Adjustable 1-30 seconds from a fixed threshold of 0,33 rated voltage.
   ii) Current limit: Adjustable from 2-5 times motor rated current.
   iii) Start voltage boost facility: Switch selectable full voltage starting for 100 ms.

b) Stopping (switch selectable)
   iv) Uncontrolled free wheel stop by switching of the supply to the motor.
   v) Controlled stop with voltage ramp (deceleration): Adjustable 2-60 seconds.

c) Switch selectable automatic and manual fault reset
d) Motor thermal protection by adjustment of the motor current setting

PMA.4.4.3.7 Protective features

a) Starter short circuit protection by means of fast-acting fuses or other approved (by the manufacturer) method.
b) Self-diagnostic internal fault check before starting.
c) Thermal:
   i) Protection of the starter against overload and over-temperature shutting the unit down. Units fitted with a cooling fan must have a fan fail alarm.
   ii) Protection of the motor against overload (slow, medium and fast overheating exceeding the motor thermal capacity) by setting the motor operating current. It must incorporate a thermal memory, taking into account previous starts, which will prevent a restart once the thermal capacity has been exceeded until the motor has cooled down sufficiently. This facility must remain operational even if the starter is bypassed once the motor is up to speed.

d) Voltage: Phase failure and phase imbalance must stop the motor.

PMA.4.4.3.8 Status display (LED)

a) Starting/stopping
b) Normal operation
c) Cooling down
d) Internal fault (starter)
e) Thermal fault (starter)
f) Overload (motor)
g) Phase failure

NOTE:
The status indication must be visible without opening the panel door (in case of panels with an inner and outer door, such as weatherproof panels, this applies to the inner door only).

PMA.4.4.3.9 Output relays

a) Fault :(1 x N/O; 1 x N/C)
b) Overload :(1 x C/O)
c) End of starting :(1 x N/O)

NOTE:
These conditions must be displayed external to the enclosure in which the starter is mounted, by means of pilot lights.

PMA.4.4.4 Power Factor Equipment

If power factor equipment has been specified in the project specification, steps must be taken to ensure that the power factor correction equipment is never connected to the starter output terminals.

I.e., in the case of individual motor correction, the motor must be directly connected to the main supply after run-up and the starter output disconnected, by means of interlocked contactors, before the power factor equipment is switched into the motor circuit. In these cases, motors must be provided with separate overload relays since the starter overload protection is then out of circuit. Note that the starter thermal memory must be retained when the motor is disconnected, to be functional if the motor is restarted.

PMA.4.4.4 Cabinet Installation

When installed in a general-purpose enclosure protection degree of IP23, sufficient space must be provided around the starters to ensure adequate air flow in accordance with the manufacturer's requirements. If sufficient cooling cannot be obtained by natural ventilation a fan(s) must be fitted. In case of IP54 enclosures, an internal cooling fan must be fitted and adequate heat exchanging surfaces must be provided (calculation to be provided on request).

PMA.4.4.5 Power Factor Equipment

If power factor equipment has been specified in the project specification, steps must be taken to ensure that the power factor correction equipment is never connected to the starter output terminals. I.e. in the case of individual motor correction, the motor must be directly connected to the main supply after run-up and the starter output disconnected, by means of interlocked contactors, before the power factor equipment is switched into the motor circuit. In these cases, motors must be provided with separate overload relays since the starter overload protection is then out of circuit. Note the starter thermal memory must be retained when the motor is disconnected, to be functional if the motor is restarted.

PMA.4.4.6 Multiple Motor Starting

Only if so specified in the project specification, may a single starter be used for cascade starting of several motors.

In such a case, pairs of interlocked contactor sets must be used for each motor to first connect the motor to the starter, then, after running up to connect the motor directly to the supply, after which the sequence is repeated for the next motor.

Motors must each be provided with separate motor overload protection relays. The starter rating and thermal capacity must be sufficient for the expected total number of starts per hour of the combined number of motors and must be clearly qualified in the tender, if not specified in the project specification.

Failure of any one drive (tripping or switched off) must not affect the starting of any of the other drives connected to the starter.

External (to the enclosure in which the starter is mounted) status indication for the drive status (start or run) must be provided for each drive via its start and run contactors by means of indication lights on the enclosure door (inner door in the case of weatherproof enclosures).

PMA.4.5 CONTACTORS

All contactors shall have easily removable contacts and coils, such as Klockner Moeller, Sprecher & Shuh or equal and approved and rated for AC 3 for normal motor starting.

All contactors shall have adequately rated coils and continuously rated coils with a drop-off value of not more than 80 % of rated voltage.

PMA.4.6 SWITCHGEAR

All switchgear shall be rated for the maximum rupturing capacity of the particular system, as specified in the projection specification, but not less than 10 kA, unless otherwise specified in the projection specification.

1. Circuit breakers
   All circuit breakers shall be of the moulded case type, unless otherwise specified in the project specification, conforming to SABS 156 and carrying the SABS mark. They shall be equipped with thermal or hydraulic devices for tripping on overcurrent and magnetic devices for instantaneous tripping on fault currents. The minimum voltage rating for single and double pole circuit breakers shall be 250 V and 440 V for three pole. The ampere rating and fault rupturing capacity shall be as specified or shown on the drawings.

2. Miniature isolators
   Miniature isolators shall be micro-gap type manually operated air break switches, suitable for flush mounting and shall be to SABS 152. Where individually mounted, they shall be in galvanized steel boxes with brass dished cover plates finished to match switch cover plates.

3. Fused switches

The fuse switch units shall be of the three-phase and neutral arrangement, having double-break moving contacts supporting H.R.C. fuses, all housed in a robust metal toggle mechanism. Interlocks shall be provided to ensure that the covers cannot be opened when the switch is in the closed position.

The fuses shall be of the H.R.C. type and shall comply fully with BS 88 category of duty A C. 4

A set of spare fuses of each rating used in the switchboards shall be supplied and handed to the representative at the site, who will issue a receipt.

PMA.4.7 METERING AND INDICATION EQUIPMENT

1. kWh meters
   The meters shall be individually tested and shall comply with SABS 1607, SABS IEC 211 and SABS IEC 521.

   Test certificates shall be supplied with each meter. The scale shall be of the cyclometer type and a definition down to 1/10th of a unit shall be provided for.

2. Maximum demand ammeters
   Moving iron ammeters suitable for 5 amp secondary current transformers shall be used.

   Ammeters shall indicate the instantaneous current and have a separate indication for a 15-minute average value, preferably of a bi-metal element type.

   The scale shall be clearly calibrated in black on a white background and both instantaneous and maximum demand readings shall be on concentric scales by means of different coloured pointers.

   Meters shall be over-scaled with a suppressed over-range corresponding to the starting current and where current transformers are used, the ratio of such transformers shall preferably be indicated on the ammeter fascia.

3. Voltmeters
   The instrument shall be a moving iron type, suitable for horizontal, as well as vertical, flush mounting.

   The scale shall be clearly calibrated in black on a white background.

   Calibration shall be up to 120 % of rated voltage and a suppressed scale at the zero reading shall be preferable.

   The instrument shall comply with BSS 89 and shall have an industrial-grade accuracy.

4. Voltmeter switches
   Voltmeter switches shall have one "OFF" and six measuring positions and shall be suitable for panel mounting in such a way that only the handle and labelling plate extends to the front of the panel.

The fascia inscriptions on the labelling plate shall be clearly marked.

The switch terminals shall be suitable for lug connection and shall be clearly marked. The contact movement shall have a roller or wiping action

The voltage rating shall be suited to the installation

5. Voltmeter fuses
The fuse base shall have a voltage rating suited to the particular installation and shall be suitable for either flush or projection mounting.

Cartridge type fuses shall be used with a nominal rating of 2 amp at 380 volts 50 Hz and a rupturing capacity of 20 000 amps.

6. Current transformers
Current transformers shall be of the air-cooled type and shall have mounting facilities. Split-core current transformers shall not be acceptable

The voltage rating shall be suited to the particular installation.

Current transformers shall have a class C accuracy and shall comply with BSS 81 and shall be suitable for a 10 V A secondary load.

PMA.4.8 SWITCHBOARDS AND CONTROL BOARDS

The switchboard shall consist of a cabinet of folded sheet steel not less than 1,6 mm thick, with panels of sheet steel mounted therein and with the required switchgear mounted on the panels. 3-CR12 sheet steel shall be used for switchboards used externally. Switchboards shall be rated to a protection degree of IP54 for external use and IP44 for use inside buildings. Switchgear shall be flush-mounted with removable front panels and hinged doors. Switchboards for external use must have rubber gaskets fitted both for the internal and external doors, to prevent ingress of dust and sand. The door construction must provide a continuous sealing edge against the gasket. Cut-outs for overlapping doors or locks will not be permitted. Coin slot type screws shall be used for securing the front panels and doors must be removable. The switchboard shall be arranged for front access to live parts as it will be placed against the wall.

The switchboard shall be floor or wall-mounted and shall have a totally enclosed air insulated busbar chamber running the length of the main switch panel.

Painting shall be in accordance with section 3 on painting and the final coat shall be light grey baked enamel or finished in baked powder epoxy. Free-standing external switchboards for pump stations shall be olive green.

The electrical equipment to be provided on the switchboard shall comply with the detailed requirements. The busbars shall be rated at ISO amps per square centimetre.

Internal busbars, of solid copper of each phase and neutral, wiring and terminals shall be of suitable size and rating and terminals shall be of brass and comply with sections 3.14.2 and 3.14.3 of SABS 152. Busbars must be solidly mounted on insulating supports with bolted lug connections to conductors. Screw type connections with clamps shall be acceptable for conductors up to and including 10 m^2

The wiring is to be installed by means of neatly arranged vertical and horizontal runs and laced together by means of “Helen Strap" or equal material. All control wiring and terminals shall be numbered with approved wire and terminal markers

Wire looms shall be strapped to rails, secured to the steelwork. Self-adhesive type securing material shall not be accepted.

Each distribution board is to be provided with a neutral and earth busbar of solid brass with one way for each circuit and for each conductor.

All equipment on distribution boards are to be clearly labelled by means of plastic engraved labels.

Labels must be fixed to the boards immediately below the equipment by means of screws or channelling.

Drawings of all boards shall be submitted for approval before commencing manufacture.

The grouping of equipment on panels will be logical and neat and shall be done on the following basis:

1. Main incoming breaker, main metering and incoming cable access.
2. Each motor circuit with sub-main breakers, starter, contactors and sub-circuit indication and metering.
3. Plant room auxiliaries and general control circuits.

Kiosk-type outdoor switchboards for sewage pump stations may not be installed over the access opening to the sump so that the panel encloses the opening. The panel must be installed on a plinth in accordance with the detail drawing so that any sewage gas from the cable opening is vented to the atmosphere.

In the absence of such a detailed drawing, the panel must be mounted on a hot-dipped galvanised steel framework bolted to the concrete plinth. This framework must raise the panel +/- 200 mm above the concrete plinth. The sides of the framework must be covered with removable galvanised diamond mesh grilles to allow free circulation of air under the panel

The panel bottom plate shall| serve as a gland slate and must be totally sealed against ingress of sewage gas.

The switchboard operating side shall not be closer than 1,0 m from the pump access opening.

PMA.4.9 **CABLES**

Cables for general use shall be 600/1 000 V grade polyvinyl chloride (PVC) insulated steel wire armoured and PVC served overall in accordance with SABS 1574 general purpose grade.

All cables that might be submerged shall be of a similar standard to the VIRTRS 660-volt grade submersible power cable.

Tenderers are required to state in the schedule of prices the sizes of the cable between the various units to be supplied under this contract. The current ratings of PVC cables shall be in accordance with the latest edition of the SABS 0142 code of practice.

The Contractor will be responsible for measuring on his final layout plan for the installation, the lengths of the different cables required. The tender price must include for the supply and installation of all the necessary cables.

No cable joints will be permissible within the plant room.

PMA.4.10 **CABLE AND EARTH CONNECTIONS**

The Contractor is required to supply, lay, fix in position and properly connect all the cables between the circuit breakers and starting equipment on the switchboard and motors as automatic control equipment, as required.

Cables, where required, are to be fixed to walls on a galvanised steel cable rack or by means of shaped galvanised saddles or hardwood cleats so that the cables are not damaged in any way. Saddling or support spacing shall be such that the cables are kept straight without sagging, but the spacing shall not exceed 750 mm.

A 50 mm minimum diameter steel sleeve pipe must be cast into the floor for a cable connection to equipment away from the floor. The end of the sleeve must be bent upwards in the position of the equipment to be connected

Care must be taken during the laying and installation of cables that the outer covering is not damaged and where any damage does occur, it shall be made good

No cables shall be bent in laying to a radius less than 12 times its outside diameter.

All cable ends are to be properly made by a workman skilled in this type of work. Cable glands for external terminations or inside pump houses shall have a compression-type outer sheath seal

.

PRATLEY or CCG weatherproof cable connection boxes shall be used as cable junction boxes above ground level. If the number of cables does not permit these weatherproof polycarbonate or galvanised steel enclosures of approved design equipped with fixed terminal strips, will be used

The Contractor is required to lay and properly connect the earth conductors between the motors, starters, switchboards and the earth mat.

All wiring and earthing arrangements shall comply with the requirements of the latest edition of the SABS 0142 code of practice and also with the requirements of the local authority

All cables crossing the floor and on the wall below a level of 450 mm above the floor, shall be protected by a robust cable covering of approved design.

PMA.4.11 **EARTHING**

All starters, motors, pumps and associated equipment must be earthed by means of a separate bare copper stranded earth conductor, connected to the earth bar of the relevant switchboard serving that equipment.

Earth conductors must be run alongside and strapped to its associated cable, equal in size to

the cable conductors, with a minimum of 6 mm^2 and a maximum of 70 mm^2. At the ends it must be fitted with sweated or crimped lugs, solidly bolted to the equipment to be earthed and each bar

If there is a spare core in a cable, this may be used as an earth conductor instead of the separate bare copper earth conductor, as specified above.
Wire armouring of cables shall not be used as on each conductor, but must nevertheless be earthed.

A suitable earth mat must be supplied at each switchboard, connected with a 70 mm^2 earth conductor, marked "earth mat" to the switchboard earth bar. If possible, the earthing system must be bonded to the water reticulation system at least once, preferably at the main switchboard.

PMA.4.12 **DRAWINGS AND INSTRUCTION BOOKS**

Within three (3) weeks after receiving written acceptance of the tender, the Contractor shall supply the following information in duplicate:

1. Plant room layout drawings showing the main items of equipment, as well as all cable and wiring diagrams.
2. Switchboard and control board outline and equipment layout drawings and details of manufacturing.
3. Single line and wiring diagrams detailing all control metering and indication circuits, inclusive of a description of circuit operation.

NOTE:
Drawings must be neat and clearly legible. Circuit diagrams must be done on a grid system with elements of control equipment referred to the applicable (grid) line numbers in a schedule directly below the relevant control device.

The function of each control element must be clearly stated on the drawings

SECTION 5: GUARANTEE AND TESTING

PMA.5.1 **GUARANTEE**

The Contractor shall submit the following characteristic curves for the performance of the plant:

Pumps
1. Head quantity curve
2. Efficiency curve
3. Kilowatt curve

Motors
4. Efficiency curve
5. Power factor curve

The Tenderer is to state in his tender the percentage tolerances within which he is prepared to guarantee:
(a) The rate of delivery at the specified duty head.
(b) The pump efficiency at the specified duty.
(c) The head quantity curve.

The Employer shall have the right to refuse acceptance of a pumping set which, under test in terms of clauses set out below, fails to deliver the specified duty discharge at the specified duty head. If the manufacturer specifies any tolerance in the delivery of the pump, the Tenderer must make due allowance for this in their design.

In the event of such refusal of acceptance, the Contractor will be afforded an opportunity to effect refinements or adjustments in order to overcome the deficiencies of the pump, failing the success of which he shall replace the pump with a new one, which will be subject to the same conditions in regard to tests and guarantees as herein specified. Pending such replacement or agreement as to delivery and use of the pump, in which case the Contractor shall deliver the pump and the Employer shall have the right to use and continue using it until it is replaced by a satisfactory new pump.

Any costs involved in any refinements, adjustments or replacements shall be at the Contractor's expense.

PMA.5.2 **FACTORY TEST**

The electrical panels shall be demonstrated in the factory to the Engineer and all equipment necessary to test the performance and operation of the panels shall be provided.

Before the Engineer is called to witness any testing, the Contractor must test the equipment on his own and confirm in writing to the Engineer that the equipment conforms to the specification.

PMA.5.3 **TESTING ON SITE**
PMA.5.3.1 Completion And Commissioning

On completion of the erection of the installation, the Contractor must commission the plant to ensure the plant operation complies with the specification and performance figures tendered.

The testing of the pumps shall be carried out strictly in accordance with BS 599 except insofar as may be amended or amplified by any other condition of this contract. During the testing of the pumping unit, careful records are to be kept of the power consumed, the power factor, the quantity delivered and the head against which the pump operates. The pumping head is to be determined from calibrated pressure gauges on the delivery and suction pipes. The power consumed is to be determined by a calibrated kilowatt-hour meter, while the power factor is to be recorded by means of a suitable instrument. The quantity delivered is to be measured by displacement in the sump, or other suitable means.

From records kept the capacity, efficiency and power input for the pumping unit shall be calculated to determine whether these are in compliance with the guaranteed figures submitted by the Contractor at the time of tendering.

An item has been included in the schedule to cover the cost of providing equipment, which must be adequately calibrated and standardised to carry out the test, as well as the cost of all labour necessary to complete the testing of the plant offered

In the event of the Contractor being unable to test the pumps at the time of its installation through circumstances beyond its control, it may be necessary for it to return to the site at a later date to undertake this work. An item has been provided in the schedule to cover the cost of returning to the site, if ordered to do so, in order to carry out the test.

The water and electric power required for the tests will be supplied free of charge by the Employer.

The following electrical tests must be carried out on the installation by the Contractor or a competent person appointed by him:

a) Before commissioning
   1. Insulation test;
   2. Continuity test;
   3. Test for the correct direction applied to every motor;
   4. Prove the correct connection and rotation of any energy meters.
   5. The settings of all overload and other adjustable protective devices shall be set to the requirements of the equipment.

b) At Commissioning
   1. Motor currents using instruments of which the errors, if any, have been established;
   2. Speed of rotation,
   3. Control of the equipment;
   4. The commissioning results, both mechanical and electrical, must be submitted to the Engineer for scrutiny before he is called out for the site acceptance testing. Commissioning test reports must be obtained from the Engineer for this purpose. A form F37 relating to the electrical installation in terms of the Occupational Health and Safety Act (Act 85 of 1993) must be submitted together with the test results.

PMA.5.3.2 Acceptance Testing

On completion of commissioning of the plant and submission of the test results for evaluation by the Engineer, the Contractor will be required to make suitable arrangements for demonstrating the plant and equipment supplied under this contract in the presence of the Engineer or his representative, to prove they comply with the specification. Any or all of the test results must be demonstrated to the Engineer at his request.

A competent person, fully conversant with all aspects of operation, must be present to carry out the demonstration.

PMA.5.4 **RE-INSPECTION**

Before the Engineer is called for an inspection to witness any final test or demonstration in the factory or on site, the Contractor must test the equipment himself to ensure that the equipment and performance comply with the specification

Should the result of such an inspection be that a re-inspection is required at the Engineer's discretion, due to non-compliance by the Contractor, the full cost of this re-inspection will be for the account of the Contractor. Such amounts will be recovered from the Contractor by deduction from any payment certificates due, at SAICE rates.

PMA.5.5 **TESTING INSTRUMENTS**

The Contractor must provide all test instruments. They must be of a high quality and calibrated yearly by an approved calibration authority. The calibration certificates must be presented an request.

Note that should the plant not be accepted at this acceptance test due to inadequate commissioning, non-compliance with the specification, or guaranteed performance figures, requiring a return visit, the full cost of the Engineer and the Contractor for this re-inspection will be for the account of the Contractor

PMA.6.1. **TYPE OF PUMPS**
PMA.6.1.1 **NON-SELF PRIM ING FOR CLEAR WATER HANDLING**

Pumps shall be of the centrifugal, non-overlaid, volute type of horizontal split double suction, multistage, or of vertical split end suction design. Operating speed shall be selected taking cognisance of the size, type of pump, and the dynamic head.

Pumps shall be directly coupled by means of flexible couplings of approved manufacture. V\/here belt-driven or close-coupled pumps are required, it shall be specifically indicated in the project specification.

Pumps shall be of the manufacturer's standard and approved design, capable of doing the duty required at a speed as specified in the project specification, and shall be so balanced that there will be no undue residual thrust when the pump is new or after wear has taken place, and suitable thrust bearings must be provided to take residual thrust. Pumps shall be

selected to suit the static suction lift or positive suction head, the static discharge head, the total head, the liquid handled, and the net positive suction head available and shall be of single or multi-stage design with or without seal flushing and balance piping as may be required for the specific project. Pump casings are to be of high-grade cast iron or other approved material, rigidly secured to a neat, properly designed bedplate or base The pump casing shall be selected on the basis of the above-mentioned criteria and taking into consideration the site conditions.

Single stage pump Shaft Seal — Un-cooled soft-packed stuffing box up to 110°C, or cooled soft-packed stuffing box over 110°C, up to 160°C. Un-cooled mechanical seals up to 140°C max. may be fitted. (See specific tender specification for type of shaft seal required)

Shaft material can be 080M40Q or 431529, depending on the material pumped

Multistage pumps, Shaft Seals — Shafts fitted with renewable protective sleeves in the region of the stuffing box. Un-cooled soft-packed stuffing boxes for temperatures up to 110°C, or cooled soft-packed stuffing boxes over 110°C, up to 160°C. Un-cooled mechanical seals up to 110°C max. may be fitted. (See specific tender specification for type of shaft seal required)

Impellers and guides shall be of bronze or other suitable metal selected for the medium to be handled, the diameter being sufficient to withstand and transmit without slip and with ample margin or safety all torsional and bending stresses to which it may be subjected. Bearings are to be of ample bearing area, dust-proof, with suitable provision for continuous lubrication.

The pump motors offered are to be selected for a kW rating of 15 % above the maximum kW rating for the impeller size installed, unless specified otherwise. Performance particulars and characteristic curves shall be submitted at the time of tendering.

High points of pump casings shall be provided with air vent cocks. Low points of casings shall be provided with valve drains and inlet and outlet connections shall be provided with properly located pressure gauge tapping. Removable parts weighing over 40 kg shall be provided with a lifting lug.

PMA.6.1.2 SELF PRIMING FOR RAW SEWAGE OR SLUDGE HANDLING

The pumps shall be of the horizontal self-priming centrifugal type specifically designed for the handling of raw, unscreened domestic sewage. Each pump at its rated speed shall be designed to retain adequate liquid in the pump casing to ensure automatic re-priming in a completely open system without suction or discharge check valves and with a dry suction leg.

The openings and passages of the pump shall be large enough to permit the passage of a sphere of 75 mm in diameter. The pump shall be equipped with a removable cover plate weighing not more than 30 kg, allowing complete access to the pump interior without disturbing suction or discharge piping

The pump shall also be fitted with a replaceable wear plate. Replacement of the wear plate, impeller and seat shall be accomplished through the removable cover plate. The entire

rotating assembly, which includes the bearing shaft, seal and impeller, shall be removable as a unit without disturbing the pump-volute or piping.

The pump motors offered are to be selected for a kW rating of 15 % above the maximum kW rating for the impeller size installed. Performance particulars and characteristic curves shall be submitted at the time of tendering

Pump casings and impellers shall be of close-grained cast iron. Impellers shall be of single or 2-vane, semi-open, non-clog design, with integral pump-out vanes on the back shroud and shall thread onto a pump shaft of stainless steel. Means the back shroud and shall thread onto a pump shaft of stainless steel. Means shall be provided for external adjustment of the impeller to the wear plate.

The shaft shall be covered and protected with a removable sleeve. The shaft shall be contained within a bearing pedestal of ample size with a heavy-duty ball thrust bearing and a radial bearing of adequate size to withstand all imposed loads. Bearing shall be oil lubricated, with the bearing pedestal cooled by pumped liquid.

The pumps shall incorporate moulded one-piece tapered suction check valves that can be removed or installed through the removable cover plate opening without disturbing the suction piping.

The pump volute casing shall contain no openings of a lesser diameter than the sphere size specified. Screens or any internal devices that create a maintenance nuisance or interfere with the priming and performance of the pump will not be permitted.

The pedestal base of the pump shall be of cast iron with moulded flanges of adequate size to accommodate the holding down bolts.

PMA.6.1.3 SUBMERSIBLE RAW SEWAGE PUMPS

Submersible raw sewage pumps shall be suitable for submersed or dry installation applications as required in the project specification.

The pumps shall be of the close-coupled centrifugal type with a motor speed as required in the project specification. The volute, motor, and seal housing shall be cast iron to BS1452 grade 220 or equivalent.

The impeller shall be SG cast iron to BS 2789 or bronze to BS 1400 of the vortex type and single or double channel for large pumps. Double-channel enclosed impellers may be used when called for in the project specification. The pump shaft shall be grade 316 stainless steel.

All bolts shall be grade 304 stainless steel. Shaft seals shall be oil-lubricated mechanical seals type.

Bearings shall be angular roller and ball bearings and shall be permanently lubricated.

The pump motors offered are to be selected for a kW rating of 5 % above the maximum kW rating for the impeller size installed. Performance particulars and characteristic curves shall be submitted at the time of tendering.

Cooling of the motor shall be facilitated by means of the pumped media for small pumps.

Where specified in the project specification oil oil-cooled or external water-cooled cooling systems shall be incorporated.

The motor shall have 1P 68 protection and class F insulation

Cable connections shall conform to the protection rating and shall be factory-fitted and sealed

PMA.6.2 PUMP EQUIPMENT AND SPARES

The pumps are to be fitted with all the necessary air-cocks and are to be provided with automatic air release equipment if necessary, including all pipe-work. The pumps shall be fitted with drains, which shall discharge into pipes leading to the outside of the building as shown on the drawings. All drains and air release pipes shall be either copper or galvanised steel and shall be properly supported along their entire length.

Each pump is to be provided with 100 mm dial glycerine-filled stainless steel cased pressure gauges calibrated in metres head and kPa to register the suction and delivery pressures. Such gauges shall be in accordance with BS 1780 table 1, with a bottom connection for direct mounting. The suction gauges shall cover a range from 50% below and above the operating suction pressure. The delivery gauges shall cover a range from zero to at least 50% in excess of the shut-off head of the pump. Calibration certificates for all gauges must be supplied by the Contractor. All the gauges shall be fitted with shut-off valves.

Complete sets of spanners, keys, and tools required for operation and overhauling, and adjustment of the pumps are also to be supplied with a lockable wall-mounted cupboard, mounted in a convenient position in the pump station. A separate item is included in the schedule of prices for the supply of all spare pump and motor parts which are not regularly kept in stock by the Contractor and which he considers to be necessary for the replacement of wearing parts, a complete list of which is to be submitted by the Contractor with this tender.

PMA.6.3 LUBRICATION

Efficient means of lubrication shall be provided for all bearings with provision for grease or oil lubrication, full details of which shall be submitted at the time of tendering.

PMA.6.4 SHAFT SEALING

The pump shaft shall be sealed against leakage by a balanced mechanical seal, the stationary seal seat of which shall be double floating and self-aligning during shock loads that will cause deflection, vibration and axial or radial movement of the pump shaft.

The mechanical seal shall be installed within a separate oil-filled reservoir of the pump pedestal, the oil being both a lubricating and cooling medium.

The seal shall be removable and replaceable through the cover plate opening.

PMA.6.5 **BEDPLATES**

Each pump and motor is to be mounted on a bedplate of rigid construction, provided with suitable openings for pouring in grout and all necessary holding down bolts for securing to the foundations, which will be constructed under another contract to the dimensions and details to be supplied by the Contractor under this contract. Concrete work to the foundations will be finished off to approximately 25 mm below the underside of the bedplate, and in erecting the pumps and motors, the Contractor shall arrange for the setting of each unit to exact line and level by means of steel wedges, and shall thereafter grout up the bedplates and finish off the foundations around them with chamfered or rounded edges.

PMA.6.6. **PIPE-WORK**

Tenders under this contract are to include for the supply, delivery and erection of all the necessary suction and delivery pipe-work, guide bars and discharge connections in order to complete the installation as shown on the relevant drawings. Tenderers should note, however, that they should adhere to the floor area as shown, unless they find it imperative to increase the size.

PMA.6.7 **ALIGNMENT OF PUMP SETS**

Pump and motor sets with short flexible couplings shall be laser aligned to comply with ANSI standards for vertical and horizontal offsets and angularity as follows

ROTATIONAL SPEED	OFFSET (mm)	ANGULARITY (mm) PER 100 mm DIAM
1 500	< 0,09	< 0,07
3 000	< 0,06	< 0,04

C3.3.3 SPECIFICATION FOR ELECTRICAL WORKS

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C3.3.3 SPECIFICATION FOR ELECTRICAL WORKS

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C3.3.3.1.1 APPLICABLE STANDARDS

a) **REGULATIONS, CODES, AND SPECIFICATIONS**

The complete installation, including the electrical, plumbing, Telkom, intercom communications, and data systems, shall comply with the current editions of:

1. The Wiring of Premises Part 1: Low-voltage installations SANS 10142-1.
2. The Wiring of Premises Part 2: Medium-voltage installations above 1kV a.c. not exceeding 22kV a.c. and up to and including 3,000 kW installed capacity.
3. Occupational Health and Safety Act No. 85 of 1993
4. Regulations of Telkom
5. Local Municipal Bye-laws and Regulations
6. Local Fire Department Regulations
7. Protection against Lightning - Physical damage to structures and life hazard. SANS 10313.
8. The Specification within the Contract Document
9. All the sections and Drawings forming part of the Contract Document
10. The relevant NRS Specifications
11. Plant and Equipment Manufacturers Specifications
12. National Building Regulations - SANS 10400.
13. SANS 10061 Part 1 The installation of communal and single antenna systems for the reception of television and sound broadcast transmissions - VHF and UHF television and VHF sound antenna.
14. SANS 10061 Part 2 The installation of communal and single antenna systems for the reception of television and sound broadcast transmissions - Satellite antenna systems.
15. SANS 1252 Passive antennae for the reception of VHF and UHF television and VHF sound transmissions.
16. SANS 1611 The mechanical requirements for satellite television receiving antennas.

b) **RELEVANT ISO AND BS STANDARDS**

PARTICULAR/GENERIC SPECIFICATIONS

For the purpose of this Contract, the following Particular and Generic Specifications shall apply:

PMA: Mechanical and Electrical Installations Health and Safety Specifications

The particular specifications referred to above have been written to cover all phases of work usually encountered in contracts of this nature and may therefore cover items of work not encountered in this particular contract. In case of any discrepancy or conflict with any part of the particular specification, the requirements of the Engineering Design shall apply

C3.3.3.2 CONSTRUCTION - PLANT AND MATERIALS

C3.3.3.2.1 MATERIALS, SAMPLES, AND SHOP DRAWINGS

This section shall be governed by the requirements of the Conditions of Contract as defined and amended in "Part C1: Agreement and Contract Data

C3.3.3.3 PROJECT SPECIFICATION

PSE 1 ELECTRICAL INSTALLATION

MMC AND CONTROL INTEGRATION

It is a specific requirement that the Winburg Central Reservoir, Fresh Water Pump Station, Water Treatment Works and Raw Water Pumps be integrated with a basic loss control telemetry system.

Typical control by water levels between the Destination and Source.

Item	Control by:		Controlled System	
	Winburg Central Reservoir	Winburg Water Treatment Works (WTW)	Winburg WTW: Fresh Water Pump(s)	Rietfontein Pump Station: Raw Water Pump(s)
1	Full		Pump Start Inhibit Pump Stops	
2.1		Empty	Pump Start Inhibit Pump Stops	
2.2		Full		Pump Start Inhibit Pump Stops

PSE 1.1 SCOPE

This specification covers the following work:

- Supply and Installation of a New Motor Control Centre at the "Wolwas Pumps"
- Alterations to the existing MCC at the Winburg Water Treatment Plant
- Alterations to the existing MCC at the Rietfontein Pump Station

- Addition of Telemetry to the Central Reservoir, Water Treatment Works and Rietfontein Pump Station
- Small electrical installations in the pump stations and associated new buildings.

PSE 2. **GENERAL SPECIFICATION**

PSE 2.1 **Standards and Specifications**

The switchboards shall meet all the applicable requirements of SANS IEC 60439. Switchboards up to and including 10 kA shall conform to SANS 1765 and shall be furnished with a test certificate signed off by a duly authorised person in terms of the SABS specifications.

Those switchboards rated higher than 10 kA shall! be a minimum of Specially Tested (STA); or Partially Type Tested Assemblies (PTTA) or Type Tested Assemblies (TTA), certified in accordance with SANS 1473.

PSE 2.1.1. Material and Fabrication

The enclosure shall be fabricated from 3CR12 sheet metal with outer panels and doors at least 2 mm thick and internal partitions at last 1.6 mm thick.

The height of the enclosure shall not exceed 2 000 mm when mounted on its base.

The sheet metal shall be suitably bent, braced and welded where necessary to form a rigid structure. Holes, doors, covers, rails, framework, etc. shall be accurately formed to provide a true and plumb structure when completed. Where welding is necessary, the excess material shall be ground to the parent surfaces to present a smooth and blemish-free surface for painting.

All bolts and nuts employed in the manufacture of the enclosures shall be grade 316 stainless steel with machined threads.

No self-threading screws or self-setting rivets (pop rivets) will be permitted, except for the fixing of DIN rail onto the chassis plates.

The complete enclosure shall be mounted on and bolted to a hot-dipped galvanised channel steel base of minimum size 76 mm x 38 mm x 3 mm, with mitred external corners. The fixing bolts shall be 216 stainless steel M10 bolts.

PSE 2.1.2 Corrosion Protection, Finishing and Painting

The enclosures shall be painted with a high-quality polyurethane-based powder coat suitable for interior and exterior conditions and applied by electrostatic spray. The sprayed powder coat shall be baked in accordance with the paint manufacturer's specification.

The enclosures shall be painted structure orange internally and externally. Chassis and mounting plates shall be white.

The dry film coat shall be as uniform as possible but shall not be less than 50 microns nor more than 100 microns. The finish shall be high gloss with a minimum of surface defects/blemishes, and acceptance shall be at the Engineer's discretion.

PSE 2.1.3 Doors

The enclosure shall be fitted with doors on the front with no rear access required. The doors shall be arranged to stand off from the face of the enclosure. Each door shall be properly stiffened and shall be twice returned at the periphery. The second return shall be gusseted in the corners to further brace the door. Large doors shall be further stiffened with "top hat" section channels welded to the inside of the door.

Each door shall be mounted on pin-type hinges and shall be secured by means of a lever-operated tapered tongue catch or catches (hinges and catches shall be Perano, Barker Nelson, or equal approved). The lever shall be provided with an external stop to prevent rotation in excess of 360°. A hole in the stop and a hole in the lever shall be provided for a padlocking facility. The locking lever shall have a suitable anti-theft / anti-vandal cover

Where doors are mounted adjacent to one another, the spacing shall be arranged to permit each door to open through at least 150°, without fouling the adjacent door. A stop shall be provided which shall prevent the door from opening further to avoid damaged paintwork.

Cover plates shall be fabricated as for the doors and shall be further stiffened to compensate for the machine-punched circuit breaker slots. The cover plates shall be secured at the top edge with at least two square key-driven catches, whilst at the lower edge they shall be secured with two 6 mm diameter tapered dowel pins located in holes drilled in the architrave. Each pin shall be fitted with a 1.2 mm thick spacer washer. Both the pins and the washers shall be welded to the cover.

Each door shall have an earth terminal and an M10 terminal welded to the door, which shall be utilised to electrically bond the door with a copper earth continuity conductor to the MCC earth bar

PSE 2.1.4 Busbar Chambers

Where required, a totally enclosed busbar chamber shall be provided throughout the length of enclosures for main DBs and MCCs.

The busbar chamber shall be fitted with front, back, and top covers to give full access to the busbars. The top covers shall be bolted on, and the front and back covers secured with square-key latches, with one catch per cover being lockable with a padlock.

PSE 3 PROJECT SPECIFIC SPECIFICATION

PSE 3.1 General

General details of the switchboards in this contract are given below. Further details are provided in APPENDIX A - SWITCHBOARD MATRIX, which is included in this enquiry. In the event of any ambiguity, the Switchboard Matrix takes precedence over the general statements offered here.

The drawings indicate the equipment required on the proposed layout.

PSE 3.1 Power Supply

The electrical supply to the various New Buildings and localized plant shall consist of a TN-S system, 3-phase, neutral, and protective earth conductors (TN-S).

The supplies to the remote pump stations supplied with 400V/230V 50Hz from the Water Treatment Works MCC shall consist of a TN-C system, 3-phases with a combined neutral and protective earth conductor (PEN).

The voltage drop from the nominal voltage is calculated to allow 10% deviation from the nominal voltage under pump start-up conditions using soft Starters and Direct Online starting (DOL).

The cables are listed in the Cable Schedule

5.3.2 Voltage

The equipment shall be suitable for operation on the maximum steady (r.m.s.) voltage and overvoltage to which it is likely to be subjected. Equipment shall be rated in accordance with the intended application for use on one of the following voltages used in South Africa:

a) A.C. circuits

1) standard voltages:

- 230 V single-phase,
- 230/400 V three-phase four-wire, and

the tolerance of ± 10 % on these voltages.

NOTE For certain equipment it may be necessary to consider the lowest voltage that is likely to occur.

2) declared voltages:

- 525 V three-phase three-wire is a commonly used voltage and the tolerance is ± 5 %.

Figure 1 SANS 10142-1 Voltage definition for equipment

SANS 10142-1:2003
Edition 1.1
(As amended 2005)

6.2.7 Voltage drop

6.2.7.1 Difference in voltage (voltage drop)

6.2.7.1.1 When all conductors of an a.c. installation are carrying their design load, the difference in voltage (the voltage drop) between the point of supply and any point of outlet or terminals of fixed appliances shall not exceed 5 % of the standard or declared voltage. (See 5.2.2 and 5.3.2.)

In the case of a 230/400 V system, the voltage drop for single-phase circuits shall not exceed 11,5 V (5 % of 230 V) and the voltage drop for three-phase circuits shall not exceed 20 V (5 % of 400 V).

In the case of single-phase circuits derived from three-phase supplies with balanced loading, the phase-to-neutral voltage drop is calculated from three-phase values divided by $\sqrt{3}$.

NOTE 1 If the phase to neutral voltage is not declared, the value can be calculated by dividing the phase-to-phase voltage by 1,73.

NOTE 2 In the case where reticulation is part of the electrical installation after the point of supply, the 5 % voltage drop should be calculated to include the reticulation part of the installation (for example, in the case of a housing scheme where submetering with a further point of control is installed for individual consumers) (see 5.2.2.1).

Figure 2 SANS 10142-1 Allowable Voltage Drop

PSE 3.2.1 Supply for the Winburg WTW, New Buildings, Pumps / Systems, and Pump Stations

The existing power supply from a pad-mounted transformer located adjacent to the existing WTW is of sufficient capacity to provide the additional power for the altered WTW

The power supply for the New Buildings and Pumps / Systems must be connected to the existing MCC in the Winburg WTW.

The doors shall be removed, and the openings provided with a suitable temporary cover (board with equipment cut-outs). The additional cut-outs shall be professionally done, and the entire door shall be treated and the paint restored to the original OEM finish.

The contractor shall supply and install the following equipment

PSE 3.2.1.1 **Existing Winburg WTW MCC:**

APPENDIX A - SWITCHBOARD MATRIX.

WATER TREATMENT WORKS MCC — Additional Items

The board-specific additions are summarized (in order they appear in the Matrix) with a description of the extra requirements:

		Function	Label
1	1 x 10A 2-pole Circuit Breaker, typically C60N Fault level: 10kA	Supply Circuit Breaker	Telemetry Supply
2	1 x 100A 3-pole Circuit Breaker, typically C6ON Symmetrical fault level: 10kA	Supply Circuit Breaker	Supply to the Administration Building

2.1	3 x Insulated Terminal / Busbars	Terminal Interface to Feeder Cable Tails: From Circuit Breaker to Terminal / Busbar: 25mm° per phase, color-coded Cu PVC. Feeder cable: 120mm Al 4-core PVC/SWA/PVC Bi-metal lugs required.	
3	1 x 100A 3-pole Circuit Breaker, typically C60N Symmetrical fault level: 10kA	Supply Circuit Breaker	Recycle Pump Station
4	1 x 60A 3-pole Circuit Breaker, typically C60N Symmetrical fault level: 10kA	Supply Circuit Breaker	Supply to Administration Building
5	1 x 10A 2-pole Circuit Breaker, typically C60N Fault level: 10kA	Supply Circuit Breaker	Chemical Store Lighting and Extract Fan(s)
6	1 x 25A 3-pole Circuit Breaker, typically C60N Symmetrical fault level: 10kA	Supply Circuit Breaker	Supply to Chemical Dosing Building
7	1 x 20A 3-pole Circuit Breaker, typically C60N Symmetrical fault level:	Supply Circuit Breaker	Supply to Settling / Mixer
8	Telemetry System	Telemetry	

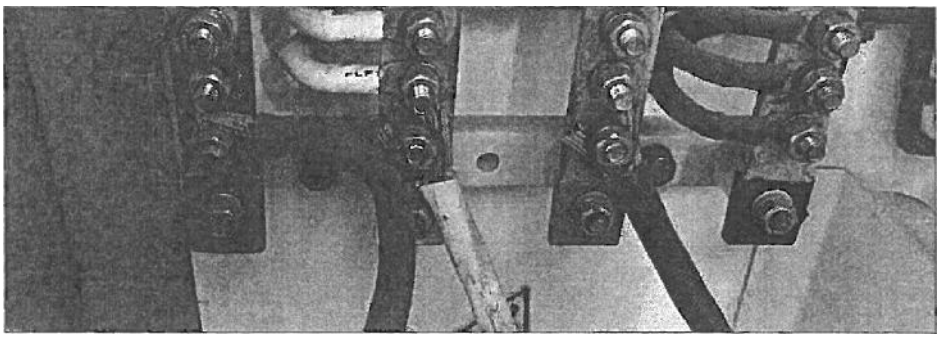
81	2 x Interposing Relays	Control of the pump based on remotely monitored water levels (reservoir)	
8.2	2 x Interposing Relays	Control of pump based on remote monitored water levels (local)	
9	Adjustable Timer 0 - 30min	Control, delay automatic Stop	

PSE 3.2.1.1.1 Supply to Rietfontein Pump Station

The existing supply cable for this pump station must be replaced as the existing cable is deteriorating, resulting in frequent cable faults and loss of too power to the pump station.

The point of supply must be formalised as detailed in the preceding items.

At present, the feeder cable is clamp-connected directly onto the local busbars, which is neither legal nor safe.



The supply is TN-C using the Neutral Conductor as a Protective Earth and Neutral (PEN) conductor.

PSE 3.2.1.2. Rietfontein Pump Station MCC:

APPENDIX A - SWITCHBOARD MATRIX.

RIETFONTEIN (DAM) PUMP STATION MCC- Additional Items

The board-specific additions are summarized (in order they appear in the Matrix) with a description of the extra requirements:

		Function	Label
1	1 x 10A 2-pole Circuit Breaker, typically C60N Fault level: 10kA	Supply Circuit Breaker	Telemetry Supply
2	Telemetry System	Telemetry	
2.1	4 x Interposing Relays	Control of the pump based on remotely monitored water levels (Water Treatment Works)	

PSE 3.2.1.3 Supply to Water Treatment Recycle Dams, Pump Station

New supply cable using the Neutral Conductor as a Protective Earth and Neutral (PEN) conductor.

The MCC and associated cabling between the MCC and PUMPS do not form part of the Electrical Installation.

PSE 3.2.2. Wolwas Pump Station

The power supply for the pump station is provided from a pole-mounted transformer. The feeder to the MCC is an Aerial Bundle Conductor (ABC), which shall be retained,

The MCC shall make provision for the entry and termination of the ABC, ensuring that the entry is suitably “glanded” to prevent the ingress of water, insects and vermin. A support pole/post shall be installed adjacent the MCC to take the strain, with a “slack span” to the MCC.

NOTES:

Each compartment shall have a removable Perspex (or similar transparent) cover which will protect against electrical shock (touch potential). The removal of this barrier shall require the use of tools and must contain at least 6 mounting points per panel.

Each door shall be independently lockable with a padlock.

PSE 3.3. **Supply Cables**

PSE 3.3.1. **SANS 10142-1**

With reference to the maximum permissible Voltage Drop as per SANS 10142-1 (refer to Figure 2 SANS 10142-1 Allowable Voltage Drop). Cable installation

Cable installation:

PSE 3.3.1.1 Excavations for Cable Trenches

PSE 3.3.1.1.1 Existing Services

Should excavations be done in close proximity to existing services, extreme care must be taken not to damage or interfere with such existing services? Only labourers with experience of these conditions may be utilised.

Should any existing service or newly installed service be damaged during the excavations, installation, or backfilling, the damaged installation/service shall be:

PSE 3.3.1.1.2. New installation/service: Replaced or repaired

Existing installation/service, replaced or repaired by the contractor or a specialist contractor at the contractor's cost. The option to repair must be requested, in writing, to the Engineer and Principal Agent, by the contractor within 3 working days of the damage occurring and shall be approved solely at the discretion of the Client and Engineer and shall be confirmed in writing before repairs commence.

Temporary repairs to restore the service/installation are permitted to avoid extended service interruptions; the cost of the temporary measure shall be for the contractor's account.

Tenderers must base their tariffs for cable trenches in soil, soft rock, and hard rock on the quantities given in the Bill of Quantities. The actual quantities shall be determined on site. Adjustments to the Contract Price shall be calculated using the tariffs in the Bills of Quantities, after completion of the installation

PSE 3.3.1.1.3 Soil Conditions / Soil Types

a) Soil:

Shall mean hand-pickable soil and includes loose gravel, clay, backfilled soil, loose or soft shale, loose literati, and rocks less than 75 mm in diameter.

b) Soft Rock:
Shall mean rock which is hand-pickable, including hard shale, dense literati and rocks exceeding 75 mm in diameter to 0,03 cubic metres me volume.

c) Hard Rock:
Shall mean granite, quartz sandstone, slate, and stone of similar hardness as well as rocks exceeding 0,03 cubic metre volume.

NOTE:

Mechanical excavators may be used for trenching operations provided that they are not used in close proximity to other plant, services, or other installations likely to be damaged by the use of such machinery.

The use of mechanical excavators shall be subject to the approval of the Client and Engineer before arrangements are made for their use.

Should excavations be done in close proximity to existing services, extreme care must be taken not to damage or interfere with such existing services? Only labourers with suitable experience of these conditions may be utilised for these excavations.

The bottom and sides of trenches must be of smooth contour and shall have no sharp dips or rises, which may cause tensile forces in the cable during backfilling.

PSE 3.3.1.1.4 Backfilling

Backfilling of trenches may commence after the trenches have been approved and shall be compacted in layers of 300 mm.

Sufficient allowance must be made for final settlement,

For the first layer of 100 mm, sifted soil of which 100 mm must be below and 100 mm must be above the cable must be used. Where no suitable soil is available on site, the Contractor shall import fill from elsewhere and make all the necessary arrangements to do so.

The Contractor shall not commence with the backfilling of trenches without prior notification to the Client and Engineer so that the cable installation may be inspected. Should the Contractor fail to give a timeous notification, the trenches shall be reopened at the Contractor's cost. Such an inspection will not be unreasonably delayed.

Backfilling of trenches may commence after the trenches have been approved and shall be compacted in layers of 300 mm. Sufficient allowance must be made for final settlement.

The 1st layer shall be 100mm thick (bedding), sifted soil.

2nd layer, 200mm thick, shall cover the Cable / Duct / Sleeve with at least 100mm (blanket), sifted soil.

Where no suitable soil is available on site, the Contractor shall import fill elsewhere and make all the necessary arrangements to do so.

The remainder of the trench shall be backfilled with approved and suitable material. Warning / Danger tape shall be installed 300mm below the finished ground level, refer to PSE 3.3.1.825.

PSE 3.3.1.2. Joints

Joints in cable runs less than full drum lengths shall not be allowed unless specified or authorised in writing by the Engineer.

PSE 3.3.1.3 Cable laying

Cables must be removed from the drums in such a manner that the cable is not subjected to mechanical damage, twisting or tension exceeding that stipulated by the cable manufacturer.

The laying of cables shall not commence until the trenches have been inspected and approved. The cables must be adequately supported at intervals during the whole operation. Particular care must be exercised where it is necessary to draw cables through pipes and ducts to avoid abrasion, elongation, or distortion of any kind. The ends of such pipes and ducts shall be sealed to approval after drawing in of the cables.

PSE 3.3.1.4 Cable ladder and galvanized steel pipe

Where cables are installed in cable tunnel/culverts, the cable shall be installed on a suitable galvanized steel medium-duty cable ladder mounted to the soffit of the tunnel/culvert.

The cable ladder shall be rated at least 45kg/m and the mounting bolts, 12 mm, shall be chemically anchored in the soffit with a minimum weight-bearing rating of 100Kg/point.

The cable shall be installed in a galvanized steel pipe with an Inner Diameter (ID) a 100mm and a minimum wall thickness of 4mm.

All piping used shall be the best quality welded galvanized pipe of approved made, free from any defects. All piping shall comply with SABS 62 and shall be medium class, galvanized to SABS 763.

Screwed fittings shall be of galvanized malleable cast iron to SABS 500 - 1955. Ordinary light type or black iron fittings shall NOT be used on the installation. Screw thread shall be to BS 21 or ISO R7 for fittings and piping.

Full radius bend and sweep fittings must be used wherever possible

All flanges shall be galvanized and shall be according to SABS 1123, Table 16.

Compressed fibred joint rings, suitably pressure and temperature rated, shall be used between all flanges. No metal or rubber jointing materials may be used

Unions shall be galvanized malleable cast iron conical face unions to SABS 509 — 1955. Flat face unions will not be permitted.

The pipe sleeves shall be either flange bolted together or threaded connections.

Special care shall be taken to prevent sharp edges from damaging the cable outer sheath. The ends of all pipes are to be cleaned from burrs and rough edges and screwed together tightly.

The steel pipes shall be mounted to the cable ladder with galvanized steel "U-Bolts," and after installation and tightening the thread on the bolt shall extend at least 3 full thread turns beyond the nut(s). Each of the exposed thread sections shall be "punched" with a suitable tool to prevent the removal of the nut(s).

The pipe shall be sloped to allow water to drain, no standing water in the pipe.

All pipe work in the ground shall be properly prepared and taped with a protective wrapping tape.

The pipe work shall be thoroughly cleaned and wire brushed before applying a smooth coat of even thickness of DENSO priming solution. The pipework shall then be taped with 1mm thick DENSO in even, firm layers with 55% overlapping to provide at least double thickness. Tape width used shall be determined on the basis of the width of the tape to equal the pipe diameter.

The taping of the pipes shall comply with SABS 0129 - 1977.

Before backfilling, the taped piping shall be covered with 0,25mm thick PVC rock shield plastic sheeting over the full trench length.

Backfilling shall not be done before the Engineer's approval has been obtained, after inspection of the tape application.

Where Bare Copper Earth Wire is used, the BCEW shall be installed in a PVC "sub-duct" of suitable dimension to avoid direct copper & galvanizing contact.

The unit of measure in the Bills of Quantities shall include: Cable ladder, mounting hardware, galvanized steel pipe and accessories, as well as the sub-duct.

PSE 3.3.1.5, Cables adjacent to other services

PSE 3.3.1.5.1 Water pipes

Cables may be installed in the same trench as water if a minimum horizontal separation of at least 500mm is maintained.

NB: Centre to Centre separation where the water pipes are equal or less than 50mm.dia. and the cable size is equal or smaller than 25mm.sq. 4-core Cu

Where larger water pipes/cables are installed, the Engineer / Department shall determine the required separation. Pipe Edge to Cable Centre separation shall then generally be no less than 1m in the horizontal plane.

Note that the cable installation depth shall not be less than specified above, and maintain the minimum cover as specified above.

Where the Cable crosses the water, the cable shall maintain the 500mm separation, and the cable will be installed under the water line (the cable shall not cross over the water line).

PSE 3.3.1.5.2. Sewage pipes

Cables may be installed in the same trench as sewage pipes if a minimum horizontal separation of at least 600mm is maintained.

NB: Centre to Centre separation 600mm - where the water pipes are equal or less than 60 mm.dia. and the cable size is equal or smaller than 25mm.sq. 4- core Cu

Where larger water pipes/cables are installed, the Engineer / Department shall determine the required separation; generally, the separation shall then be no less than 1m in the horizontal plane. Pipe Edge to Cable Centre - where the water pipes are equal or less than 160mm.dia. and the cable size is equal or smaller than 25mm.sq. 4-core Cu.

Note that the cable installation depth shall not be less than specified above and maintain the minimum cover as specified above.

Where the cable crosses the water, the cable shall maintain the 500mm separation and the cable will be installed under the water line (the cable shall not cross over the water line).

PSE 3.3.1.6. Sleeves

All sleeves indicated on the drawings must be supplied and installed as part of this contract.

Sleeves shall generally extend 1 m beyond the edge of the surface cover and generally sleeves shall be installed 1 m below the surface cover.

Horizontal spacing:

Electrical cable sleeves and communication sleeves must be installed at least 1000mm apart.

Vertical spacing:

Electrical cable sleeves and communication sleeves must be installed at least 1000mm apart.

Sleeve crossings:

All crossings between electrical and data/electronic service sleeves must be at 90°, and the data/electronic service sleeves shall be on top.

Before backfilling the ends of all sleeves must be sealed:

Unutilized sleeves:

Empty (spare sleeves) with proprietary end caps,

Utilized sleeves:

Where cables have been installed in sleeves, the ends shall be sealed to prevent the ingress of soil.

PSE 3.3.1.7 Cable Markers

Cable markers must be provided on all cable runs at 50 m intervals on straight runs and at all changes in direction, where cables pass under walls or structures, the position shall be marked with a cable marker on both sides of the obstacle.

The position of cable markers must be confirmed on site.

Cable markers must consist of 150mm x 150mm x 400mm high concrete blocks with aluminum or other rust-free metal plates marked with arrows to indicate the route, burial depth, system voltage and cable size and number of cables.

The cable markers must protrude 100mm above finished ground level

PSE 3.3.1.8. Danger / Warning tape

Yellow PVC marking tape, 150 mm wide, must be supplied and installed at 300

mm below final ground level. The wording "Electric Cable" must be provided on the marking tape.

The marking tape shall be installed directly above the cable.

Where multiple cables are installed in parallel, multiple marker tape bands shall be installed and the tape shall extend at least 50mm beyond the outer edges of the installed cables.

PSE 3.3.2. **Cable Schedule**

Water Treatment Works

Item	From	To	Cable	Installation
1	WTW MCC	Pump 1	1 x 95mm^2 4-core Cu PVC/SWA/PVC + Use 4th Core as Earth	Surface / Free Air
2	WTW MCC	Pump 2	1 x 95mm^2 4-core Cu PVC/SW/VPVC + Use 4th Core as Earth	Surface / Free Air
3	WTW MCC	Blower 1	Existing	
4	WTW MCC	Blower 2	1 x 10mm^2 4-core Cu PVC/SWA/PVC + Use 4th Core as Earth	Surface / Free Air
5	WTW MCC	Drainage	Existing	
6	WTW MCC	Rietfontein Pump Station	1 x 120mm^2 4-core Al PVC/SWA/PVC + Use the 4th Core as Earth	Underground, Surface / Free Air
7	WTW MCC	Recycle Pump Station	1 x 35mm^2 4-core Al PVC/SWA/PVC + Use the 4th Core as	Underground

			Earth	
8	WTW MCC	DB Admin Building	1 x 10mm^2 4-core Cu PVC/SWA/PVC + Use 4th Core as Earth	Underground
9	WTW MCC	Chlorine Store	1 x 4mm2 3-core Cu PVC/SWA/PVC + Use the 3rd Core as Earth	Underground
10	WTW MCC	DB Dosing	1 x 4mm^2 4-core Cu PVC/SWA/PVC + Use the 4th Core as	Underground
11	WTW MCC	Settling / Mixer	1 x 4mm^2 4-core Cu PVC/SWA/PVC + Use the 4th Core as Earth	Underground
12	WTW MCC Telemetry	WTW Fresh Water Chamber Level Sensor Full / Empty (Low)	1 x 4mm^2 4-core Cu PVC/SWA/PVC +	Underground, Surface Galvanized Conduit
13	V\/TW MCC Telemetry	Recycle Pump Station MC Interposing Relay	1 x 4mm^2 4-core Cu PVC/SWA/PVC +	Underground
14	\A/MW MCC Telemetry	Rietfontein (Dam) Pump Station MCC Interposing Relay	1 x 4mm^2 4-core Cu PVC/SWA/PVC +	Underground
15	MCC/ Telemetry	Interposing Relay	1 x 1 5mm' Cu PVC	In panels

Rietfontein (Dam) Pump Station

Item	From	To	Cable	Installation
1	Rietfontein (Dam) Puma Station MCC Interposing Relay	Interposing Relay Pump Inhibit / Stop	1 x 1.5mm^2 Cu PVC	In panels
2	Rietfontein (Dam) Pump Station MCC Interposing Relay	Interposing Relay Pump Running	1 x 1.5mm^2 Cu PVC	In panels

Wolwas Pump Station

Item	From	To	Cable	Installation
1	Wolwas MCC	Pump 1	1 x 50rnm^2 4-core Al VC/SWA/PVC + Use 4th Core as Earth	Underground, Surface / Free Air
2	Wolwas MCC	Pump 2	1 x 50mm^2 4-core Al VC/SWA/PVC + Use 4th Core as Earth	Underground, Surface / Free Air

Winburg Central reservoir

Item	From	To	Cable	Installation
1	Telemetry	Level Sensor Full / Not Full	1 x 4mm^2 4-core Cu PVC/SWA/PVC +	Surface Galvanized Conduit

PSE 3.4. **Wolwas Pumps MCC**

The Motor Control Centre shall be as follows

This MCC switchboard shall be floor-standing on a concert plinth. NB: Allow for a Telemetry Compartment in the MCC panel.

NAME	Wolwas MCC 1
Type	Outdoor, floor-standing, plinth-mounted
Manufacture	2,0 mm 3CR12
Sectioning	Multi-section, Form 3 to SABS IEC 60439
Fault level withstands	10 kA for 1 second at 400V
Surge Protection	Class 1, Type 1. limp & In 35kA Uc 440V, tA <100ns, Remote Signaling Change over Contacts (AC 250V/0.5A), Fault Indicating: Red/Green
Finish	Painted: Powder Coating Internally Light Orange (B26 to SANS 091).
Cable entry	Incoming - Cable compartment/box for Aerial Bundle Conductor. Outgoing — Bottom.
Base	None
Access	Front access only
Doors	Lockable
Electrical details	APPENDIX A - SWITCHBOARD MATRIX
Protection	IP55 (doors closed) IP21 (doors open)

PSE 3.5. **Sections**

“Sections” in this instance do not necessarily refer to separate compartments, but instead rather separate doors, unless otherwise specified. Generally, the switchboards shall be divided into sections for the following (refer to the switchboard matrix for further details).

PSE 3.5.1 **Incoming section**

This shall be equipped complete with a suitably rated main circuit breaker toggled through the inner door, or door-interlocked, as specified

PSE 3.5.1.1 Metering and sensing protection

The incomer shall have fuse-protected metering and sensing circuits, which shall consist of the following: 16A busbar-mounted HRC fuses, 3P+N and 4A front panel-mounted HRC fuses, 3P+N.

PSE 3.5.1.2 Voltmeter

96 mm x 96 mm, with a seven-position selector switch. The voltmeter selector switch shall be arranged so that voltages between phases and phases to neutral can be read. The switch shall be of the break-before-make type.

PSE 3.5.1.3 Ammeters

Three combination maximum demand instantaneous CT-driven ammeters, one for each phase, shall be provided. These shall be 96 mm x 96 mm and shall have coloured surrounds representing each phase, i.e., Red, White, and Blue.

The ammeter shall have an indelible red line on the face, as well as a label directly above the meter, indicating the full load current for the MCC

PSE 3.5.1.4 Phase failure/sequence

Phase failure protection shall be provided on the incomer switchboards where specified, which will trip all equipment by disconnecting the control circuit in the event of a phase failure, voltage imbalance.

PSE 3.5.1.5 Surge protection

Class I or Class II surge arresters (3P + N), as according to SANS 61643-1 and SANS 10142, shall be installed as specified.

Metering

For the Main distribution board, a CT-operated 3-phase kWh and maximum demand kVA meter shall be provided in the incomer section.

PSE 3.5.1.6 Visibility of meters

All metering and indicating meters shall be installed, with cut-outs in the door or panel, allowing the meter to be read without the need for opening the cubicle.

PSE 3.5.2 **Local distribution section**

A 230 V, 16 A 3-pin door-mounted, weatherproof switch socket outlet shall be provided complete with a protective circuit breaker and earth leakage device.

Refer to Appendix A —Wolwas MMC Switchboard Matrixes. The door shall be bonded to the MCC earth bar by means of a flexible earth strap.

PSE 3.5.3 **Standard Drive equipment**

Each drive cubicle shall be equipped with at least the following:

Suitably rated Door-interlocked circuit breaker

72 mm x 72 mm CT-driven logarithmic scale instantaneous ammeter (direct reading up to 7.5 kW or 20 A). The ammeter shall have an indelible red line on the face, as well as a label directly above the meter, indicating the full load current for the respective drive

Run-hour meter of 48 mm x 48 mm size. These small be non-resettable, recording up to 99999 hours with a visible rotating disk.

Hand/Off/Auto selector switch with Start/Stop push buttons and Run/Trip indicator lights

PSE 3.5.4 **Control section**

Separate cubicle with all common controls for all drives in the switchboard, as well as indicator lights for general alarms, levels, etc.

Transmitters for ultrasonic level sensors and magnetic flow meter transmitters shall also be housed in this control section, where applicable.

PSE 3.5.5 **Wolwas MCC: Telemetry Section**

Separate cubicle for future telemetry equipment.

PSE 3.6. **Telemetry**

PSE 3.6.1 **Water Treatment MCC**

The Water Treatment Works MCC shall be provided with the necessary telemetry equipment to provide the following functions:

Item	Function
1	16 digital inputs
2	4 relay outputs
3	8 analogue inputs
4	IO expansion capability
5	Data transceiver
6	Local logging functionality (72-hour storage)
7	Local PLC control functionality
8	Store and forward repeater functionality
9	Battery backup
10	Surge protection on incoming mains and analogue inputs
11	Telemetry frequency 44d-450MHz
12	RTU

A typical system that would satisfy the requirements is based on a Miri AD2006 module.

PSE 3.6.2 **Rietfontein (Dam) Pump Station MCC**

the Water Treatment Works MCC shall be provided with the necessary telemetry equipment to provide the following functions

Item	Function
1	16 digital inputs
2	4 relay outputs
3	8 analogue inputs
4	IO expansion capability
5	Data transceiver
6	Local logging functionality (72-hour storage)
7	Local PLC control functionality
8	Store and forward repeater functionality
9	Battery backup
10	Surge protection on incoming mains and analogue inputs
11	Telemetry frequency 440-450MHz
12	RTU
13	Antenna
14	Mast
15	All cabling

A typical system that would satisfy the requirements is based on a Miri AD2006 module.

PSE 3.6.3. **Winburg Central reservoir**

The Winburg Central Reservoir shall be provided with the necessary telemetry equipment to provide the following functions:

Item	Function

1	4 digital inputs
2	2 relay outputs
3	4 analogue inputs
4	IO expansion capability
5	Data transceiver
6	Local logging functionality (72-hour storage)
7	Local PLC control functionality
8	Battery backup
9	Surge protection on incoming mains and analogue inputs
10	Telemetry frequency 440-450MHz
11	RTU
12	Antenna
13	Mast
1ñ	AIR cabling

A typical system which would satisfy the requirements is based on a Miri AD4000 module.

PSE 3.6.4 **Level sensors**

At each pump station, suitable Mabrey level sensors to control the pumps shall be provided, the measurement shall be limited to digital level indication; Full / Not-Full and Not-Empty / Empty (Low).

PSE 3.6.5 **Telemetry alarms, reporting, and data exchange**

General operational alarms must be collected at the Water Treatment Work Telemetry

- Power (AC) failure
- Intruder alarm (on telemetry box)
- Battery charge state
- Full
- Empty

PSE 3.6.6 **Training**

The appointed contractor should provide the necessary training to the officials in order to operate and use the telemetry system with the newly added infrastructure components. An up-to-date and site specific user manual (three hard copies and three digital copies [In MS Word and PDF format]) shall be provided.

PSE 4 **SYSTEM CONTROL PHILOSOPHY**

PSE 4.1 **Fresh Water Pumps**

The start control consists of a manual push button or automated control (beyond the scope of the electrical contract).

The Scope included in the Electrical Works is to add the necessary control interposing relays to:

- Inhibit (prevent) the freshwater pumps from running when
  - The Winburg Central Reservoir is Full or
  - The supply of Fresh Water is Low.

- Stop the freshwater pumps when:
  - The Winburg Central Reservoir is Full, or at
  - The supply of Fresh Water is Low

.

PSE 4.2 **Raw Water Pumps**

The start control consists of a manual push button or automated control (beyond the scope of the electrical contract).

The Scope included in the Electrical Works is to add the necessary control interposing relays to:

- Inhibit (prevent) the raw water pumps from running when
  - The Fresh Water Output Chamber is Full at the Water Treatment Works.

- Stop the raw water pumps when
  - The Fresh Water Output Chamber is Full at the Water Treatment Works

PSE 4.3 **Recycle Water Pumps**

The start control consists of a manual push button or automated control (beyond the scope of the electrical contract).

The Scope included in the Electrical Works is to add the necessary control

interposing relays to:

- Inhibit (prevent) the recycling water pumps from running when:
  - The Fresh Water Output Chamber is Full at the Water Treatment Works, and
  - The Raw Water pumps are stopped / off
- 3top the recycle water pumps when
  - The Raw Water pumps are stopped / off.

PSE 4.4 **Wolwas Pumps**

The start control consists of a manual push button or automated control (beyond the scope of the electrical contract).

- Run dry / overload protection in the starter.

PSE 5 **SWITCHGEAR AND CONTROL EQUIPMENT FOR LOCAL SWITCHBOARDS**

PSE 5.1 **General**

All equipment shall be of sizes, ratings, and specifications as detailed in the switchboard matrix, and as shown on the single line diagrams.

All equipment shall be SABS certified and shall be approved by the Engineer in writing before acceptance for use on the project.

PSE 5.2 **Main Power Supply**

All electrical supplies shall consist of 3-phase (L1, L2, and L3) + Neutral (N) + Protective earth (PE) conductor.

PSE 5.3 **Power supply for DC services**

The DC backup supply shall provide sufficient power for the telemetry section to remain fully functional for 24hours with the depth of discharge limited to no more than 20% of the rated capacity of the battery.

The batteries shall be contained in a separate lockable enclosure with sufficient ventilation, corrosion-proof (especially with regard to battery acid and vapours), the bottom of the enclosure shall form a bund which will contain 125% of the battery acid volume. The battery enclosure shall be provided with a suitably rated DC switching device and protected against short circuit currents, 2 replaceable fuses and 2 fuse holders. In addition, 4 fuse holders shall be installed/mounted with 4 spare fuses.

The preference battery type is: VRLA battery with a gelified electrolyte (Gel battery).

The Control / Telemetry Power Supply shall be provided with Earth Leakage Protection as well as protection against overcurrent and fault currents. In the event that fuses are utilized each panel shall be provided with 2 complete sets of spare fuses, in suitable fuse holders, and the fuse ratings shall be clearly identified at each location.

PSE 5.4 Circuit Breakers

Circuit breakers and main isolator shall be of "toggle through" configuration with a secondary protective cover located behind the door, which is transparent (clear), prevents inadvertent contact and require the use of tools to remove. This will allow for visual inspection of the equipment without switching off the equipment.

When specified the circuit breakers and isolators shall have door-interlocked handles. The handle shall form part of the panel door. It shall not be possible to close the breaker without the door being closed and it shall not be possible to open the door without the breaker being switched off.

PSE 5.5 Pushbuttons

Pushbuttons shall have a non-metallic surround. The pushbuttons shall be of the round, flush, spring-loaded type, 22.5 mm in diameter, of colours as follows:

START	Green
STOP	Red

LAMP TEST	Yellow
RESET	Black

PSE 5.6 **Indicator Lamps**

Indicator lamps shall be similar in appearance to the pushbuttons and shall have a non-metallic surround. The lamps shall be flush-mounted with BA9s lamp holder and multi-LED lamps.

Lenses shall be plastic, of colours as follows (for functions as required): Incoming section

ON _____	Green
OFF	Red

For the pump sections

RUN	Green
STOPPED	Red
TRIPPED	White
EMERGENCY STOP ACTIVATED	Amber
NO FLOW	Red

PSE 5.7 **Selector Switches**

These shall preferably be of the same manufacturer as the push buttons and indicator lamps. The selector switches shall be of multiple positions as shown, with rotor handles fitted to a legend plate of 40 mm minimum height.

PSE 5.8 **Contactors**

Contactors shall be in accordance with the relevant codes and specifications. Contactors shall have suitable capacities for direct-on-line starting, star delta starting, or any other form of starting, whichever is relevant. The contactors shall be rated for at least 130% of the associated load current and an average of 12 switching operations per hour with an expected electrical life in excess of 10 000 switching cycles.

Each contactor shall be provided with at least two normally open and two normally closed auxiliary contacts, unless otherwise specified. Where the number of auxiliary contacts

required for remote and automatic operation is greater than can be accommodated on the contactor, an auxiliary relay or an additional contactor shall be provided.

Each contactor shall be capable of carrying, making and breaking overcurrents during the operating time of its own overcurrent tripping devices at a recovery voltage of 90% of the specified system voltage.

All Contactors for starting squirrel-cage motors direct-on-line shall be rated to break 10 times the full-load running current of the motor.

The contactors for switching between direct on-line or variable frequency operation of the drives shall be 6-pole changeover contactors. This shall provide inherent mechanical interlocking of the drive selection.

PSE 5.9 **Soft Starters**

Be from the same type and manufacture as the existing Soft Starters, utilizing the same programming and communication protocols.

Input voltage

- 400VAC +/- 10%, 3 phase, 48-52 Hz.

Voltage tolerance + or - 10% of specified line voltage. Environmental operating conditions: 0 to 40°C, 0 to +/-1400 meters above mean sea level, less than 95% humidity, and non-condensing

PSE 5.10 **Name Plates and Labels**

All labelling shall be glued and screwed with brass or stainless steel screws/bolts and nuts.

Equipment labels within the switchboard shall be fixed to the chassis plate, but may be fixed to the lids of the trunking, should the wiring obscure the labels. The labels shall correspond to the items as shown on the wiring diagrams.

All notices and labels for warning purposes or indicating dangerous conditions shall be in English

PSE 6 WIRING, CABLE TERMINATIONS, AND GLANDING

PSE 6.1 General

All wiring within panels may be enclosed in PVC slotted ducting. The exception is signal and instrumentation cabling passing through power compartments or cubicles, which shall be in galvanised screwed conduit. Wiring outside of panels and switchboards shall be run within galvanised ducting or conduit.

All wiring and terminations shall be labelled with identification tags corresponding to the wiring diagrams. Cable terminations shall be marked with an identification label externally to the switchboard indicating the source of supply as well as the equipment being fed for feeder cables. For example: “FED FROM MCC PANEL 2” and “SUPPLY TO PUMP 1”.

All glands for cable shall be nickel-plated brass and fitted with waterproof neoprene shrouds.

PSE 6.2 Internal switchboard wiring

No joints will be allowed in internal wiring, and all connections to busbars or earth bars shall be made with approved tinned copper cable lugs soldered or crimped to the ends of the conductors and bolted to busbars by means of cadmium-plated high tensile steel bolts and nuts provided with spring washers.

All wiring is to be kept free and away from any exposed terminals or other uninsulated current-carrying parts. Wiring shall also be kept free from metal edges and shall be protected where they cross metal edges. Grommets shall be installed in each hole in the metalwork through which conductors pass. Connections to equipment on swing doors shall be arranged so as to give a twisting motion and not a bending motion to the conductors.

Wires shall be clearly marked at all termination points in accordance with the numbering of the board manufacturer's wiring diagram, by means of suitable markers.

When the board main disconnector or local disconnector is switched off, no live incoming or other wiring shall be accessible. The incoming terminals shall be screened or inaccessible.

Where connections are taken from the incoming sides of the main switch, they shall be screened by a cover marked “ISOLATE FEEDER BEFORE REMOVING COVER”.

If any circuits are energised from other sources, clear warning notices to that effect shall be fitted and such terminals shall be clearly marked.

PSE 6.3 **External switchboard wiring**

Wiring external to the switchboard, such as connections to no-flow switches, pressure switches etc., shall have a maximum potential of 48 V.

PSE 6.4 **Terminals**

Each terminal block shall have provision for clip-in numbering or labelling strips to be installed, together with clear protective caps and shall be clearly marked in accordance with the Board Manufacturer's drawings and wiring diagrams.

All outgoing circuits of the switchboards shall be provided with suitable terminal strips of the shoe clamping type, a rating of at least 15A and wired in such a manner that all incoming cables installed at the site can easily be connected. Terminals that rely on pinch screws rotating on wire strands shall not be acceptable.

Terminal strips for auxiliary power, control alarm and trip circuits, etc. shall be kept separate to ensure that cables can be made off without disturbing power cables.

PSE 6.5 **Conduit and wiring**

The total installation must be in steel conduit; black conduit shall be used, where the conduit is exposed to damp conditions (typically outside, in plant rooms, and in shafts) galvanized steel conduits shall be used. All conduit shall, as far as practical, be flush-mounted or cast into the concrete; the use of surface-mounted conduit shall be confirmed in writing by the Client / Engineer before.

All conduits shall bear the stamp of approval by the SABS.

All conduits, regardless of the system employed, shall be installed strictly as described in the applicable paragraphs of this specification. Wiring of the installation shall be carried out as directed in this specification.

Galvanised draw wires must be provided in all conduits provided for other services.

Flexible conduit shall be made of galvanised steel with rectangular cross-section corrugations to fit standard brass connectors and shall have a PVC sheath. Correct fittings and fixtures must be used. An earth continuity conductor must be installed with all flexible conduits.

Bushes on metal conduit shall be of brass only.

All outlet box cover plates must be metal and steel outlet boxes must be hot-dipped galvanised to SANS 763.

Blank cover plates on round outlet boxes must be fixed with flat-head brass screws and a gasket to seal the box.

Blank cover plates on 100 x 100 mm outlet boxes must be fixed with two countersunk chrome screws

PSE 6.5.1 **Wiring Light Circuits**

All light circuits, unless otherwise specified below or when indicated on drawing(s), shall be wired with 2.5mm.sq. PVC insulated stranded copper General Purpose Wire with 2.5mm.sq. Stranded Copper Earth Wire

PSE 6.5.2 **Wiring Switched Socket Outlets**

All switched sockets, outlets, circuits, unless otherwise specified below or when indicated on drawing(s), shall be wired with 4mm.sq. PVC insulated stranded copper General Purpose Wire with 2.5mm.sq. Stranded Copper Earth Wire

PSE 6.5.3 **Wiring Power Points / Welding Plugs in General**

Generally, power point circuits, unless otherwise specified below or when indicated on drawing(s), shall be wired with 4mm.sq. PVC insulated stranded copper General Purpose Wire with 2.5mm.sq. Stranded Copper Earth Wire.

PSE 7. **INSPECTIONS, TESTS, MEETINGS, AND COMMISSIONING**

PSE 7.1 General

Should it be required that any test or inspection for any piece of equipment, such as MCC's be necessary, the Tenderer shall allow in the Tender price for the cost of travel, accommodation, and subsistence for the Engineer and a representative of the Client (2 people).

PSE 7.2 **Tests**

The Contractor shall notify the Engineer in writing at least 2 weeks in advance should his presence be required for inspections or witnessing of tests.

In the event that tests fail, the Contractor will be required to perform such tests again. Should these tests require the Engineer to be present again, the Engineer's cost for time and travel shall be recovered from the Contractor at rates as set out by the Engineering Council of South Africa (ECSA): Time-Based Category B.

Test and calibration certificates shall be furnished detailing the results of the manufacturer's tests on the MCC and instrumentation as required. This information shall be bound into the operating and maintenance manuals.

PSE 7.3 **Inspections**

The Engineer and the Client, or their representatives, are to be notified as to the manufacturing progress of the switchboards, and reserve the right to inspect them at the following holding points prior to release:

- After sheet metal fabrication, prior to painting
- After painting, prior to installation of switchgear and other equipment

Works acceptance (function) tests of the MCC shall be performed, which shall be witnessed by the Engineer and the Client.

PSE 7.4 **Commissioning**

The Tenderer shall make provision for the commissioning as set out in the Standard Specification.

Prior to the commissioning witnessed by the Engineer, the Contractor shall have performed all phase and directional rotation testing, earthing tests, etc.

PSE 8. **SPARES AND TOOLS**

At completion of the work, before commissioning, the Subcontractor shall submit for approval by the Engineer a full list of the spares he intends providing

Where the supplier or manufacturer recommends specific spares, these shall be included in full in the list for approval.

Generally, spares shall include the following:

- LV fuses. 6 spares per type and rating
- Indicator lamps: 2 spare for every 10 or less of each colour installed
- Push buttons: 1 spare for every colour installed
- Lamps of Luminaires: 2 spare for every 10 or less of each type installed

Any special tools required to perform routine maintenance on any specific item of equipment shall be provided under this contract.

PSE 9. **EARTHING**

PSE 9.1 General

MCC: Bonding of the installation shall be by Kwena Antitheft or Bare Copper Earth (BCE) wire or PVC insulated conductor strapped to the LV power cables and connected to the earthing bars in the MCC on the supply side and to the equipment on the feed side.

Switchboards: TN-S: The Neutral of the supply cable shall not be bonded to the Earth in the switchboards.

MCCs: TN-C changing to TN-S: The incoming cable "Neutral" (which serves as the PEN conductor) of the supply cable shall be bonded to the Earth in the MCC and the Earth Bar shall be bonded to the Neutral Bar in the MCC.

PSE 9.2 Bonding

All metallic cable support systems and lifting structures shall be bonded to the earth system to form a continuous earth path.

The bonding straps shall be screwed to the equipment and shall comprise insulated copper wiring of 6,0 mm^2.

The bonding of the Lifting Structure shall be by means of a 50 mm^2 bare, stranded copper conductor, complete with lug, bolted to the structure.

Care shall be taken that the earth conductor cannot be easily removed

APPENDIX A - SWITCHBOARD MATRIX
WATER TREATMENT WORKS MCC — ADDITIONAL ITEMS

Item	Section i Cubicle	Tag	Rating	Type of Starter	Selector switches	Push button s	Indicator lamps	Metering and Indication					Protective devices								Other	Comment / Control
								kVA	V	A	CT	R/h	CB	Isa l	D/l	E/L	PF	OL	KL	SF		
	WTW MCC																					
1.1	Main Incomer	Utility Main	315k\/A																			
1.Z	Main Incomer	Surge																				Existing
1.3	Power Factor correction	PFC																				Existing
.4	Pump No.1	P01	110 kW	ABB STEK																		
1.5	Pump No.2	P02	110 kW	ABB PSTEK																		Existing
1.6	Clarifier	Clarifier											SOA P(?)									Existing
17	Blower 1	Blower 1	5.5kW	DOL																		Existing
1.8	Blower 2	Blower 2	5.5kW	OOL																		Existing
1.9	Drainage	Drainage	4kW	DOL																		Existing
1.10	Local.	Sub Main	100A-										100A TP									Existing
1.10.1	Local.		SOA										SOA TP									Existing
1.10 2	Local.		3 x10A										1 0A SP									Existing
1.10.3	Local.		1 x 16A										16A SP									Existing
1.10.4	Local.		S x 20A										ZOA SP									Existing
1.10.5	Local.	ELU	63A										63A DP									Existing
1.10.6	Local.	ELU											4P									Existing
1.10.7	Local.		SOA										SOA 4P									Existing
1.10.8	Local.	Telemetry											1 0A DP									Additional
1.11	Rietfontein MCC-	Rietfontein Pump Station	100A										10 0A TP									Additional

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Item	Section i Cubicle	Tag	Rating	Type of Starter	Selector switches	Push button s	Indicator lamps	Metering and Indication					Protective devices								Other	Comment / Control
								kVA	V	A	CT	R/h	CB	Isa l	D/I	E/L	PF	OL	KL	SF		
3.12	Recycle dams MCC-	Recycle Pump Station	100A										100A TP									Additional
1.13	Admin Building•	DB Admin											60A TP									Additional
1.14	Chlorine Store	Chlorine Store											20A OP			Y						Additional
1.J5	Dosing Building	DB Dosing											25A TP									Additional
1.16	Settling/ Mixer	Settling / Mixer											20A TP			Y						Additional
1.17	Telemetry	System-																				Additional
1.18	Telemetry	Delay OFF timer 1	0-30min																			Additional
1.19	Telemetry	Delay OFF timer 1	0-30min																			Additional
1.20	Telemetry	Delay DFF timer 1	0•30min																			Additional

Legend:
DOL=Direct on Line / S-D=Star Delta (Y / A) / SS=Soft Starter (with by-pass) / (VSD/VFD=Variable Speed Drive / Variable Frequency Drive) MOA=Manual/Off/Auto / I=Start / O=Stop / RS=Reset / R— Run/ E-Emergency Stop / T=Trip / OH=Overheat / LT=Lamp Test / Spot=Speed Pot / NF=No flow / PPS—Phase failure phase sequence CT=CT Driven Ammeter / CB=Circuit Breaker / Isol=Isolator / D/I=Door interlocked / E/L=Earth Leakage / PF=Phase fail OL=Overload / KL=KIixon / SF-Seal Fail / TH=Thermistor / PFC=Power Factor Correction EPG = Emergency Power Generator

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

WOLWAS PUMPS MCC

"Item	Section Cubicle	Tag	Rating	Type of Starter	Selector switches	Push buttons	Indicator lamps	Metering and Indication					Protective devices								Other	Comment / Control
								kVA	V	A	CT	R/h	CB	Isol	D/I	E/L	PF	OL	KL	SF		
1	Wofwas MCC:																					
.1	Main Incomer	Utility Main	100kVA				Y	Y	1	3	3		160A TP 0.5-1.0		Y		Y					15kA Fault. Busbar rated minimum 200A
2	Main Incomer	Surge					R/O/T/NF															35kA, Type 1, Class Change Over Contacts.
3	Power Factor Correction	PFC	15 kVAR								1		40A TP + AC3 80A Contactor			Y						PFC + Switch in Contactor when a puma is running
.4	Pump No. 1	P01	15 kVAR	SS	MO	I/O/RS	R/O/T/NF			3	4	1	100A TP 0.5-1.0 tu		Y	Y		Y				Stop/3tart: SS, no flow, overload, timer, phase failure, phase sequence, earth fault.
5	PumpNo2	P02	45 kW	SS	MO	I/O/RS	R/O/T/NF			3	4	1	100A TP 0.5-1,0 la		Y	Y		Y				
.6	Local.	Sub Main											30A TP		N							Local Main
6.1	Local.	ELU											32A TP	Y								Earth Leakage Unit
6.Z	Local.	PP1											20A TP			Y						Panel Welding Plug
6.3	Local.	TEL											10A SP	--		Y						Telemetry
6.4	Local.	Light(s)											10A SP			Y						Light Circuit
6.5	Local.												15A SP			Y						Panel switched Socket Outlet
6.6	Local.	Oil Skimmer											20A TP			Y						Supply to Oil Skimmer
6.7	Spare SP1	Spare											10A DP			Y						Spare for1-phase supply

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

Legend:
DOL=Direct on Line / S-D=Star Delta (Y / A) / SS=Soft Starter (with by-pass) / (VSD/VFD=Variable Speed Drive / Variable Frequency Drive) MOA=Manual/Off/Auto / I=Start / O=Stop / RS=Reset / R— Run/ E-Emergency Stop / T=Trip / OH=Overheat / LT=Lamp Test / Spot=Speed Pot / NF=No flow / PPS—Phase failure phase sequence CT=CT Driven Ammeter / CB=Circuit Breaker / Isol=Isolator / D/I=Door interlocked / E/L=Earth Leakage / PF=Phase fail OL=Overload / KL=KIixon / SF-Seal Fail / TH=Thermistor / PFC=Power Factor Correction EPG = Emergency Power Generator

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

VAAL CENTRAL WATER

CONTRACT NO. VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

PART C4: SITE INFORMATION

1. SITE INFORMATION

1.1 DESCRIPTION OF SITE AND ACCESS

The site is located approximately 4.5km from Winburg town in a southerly direction.

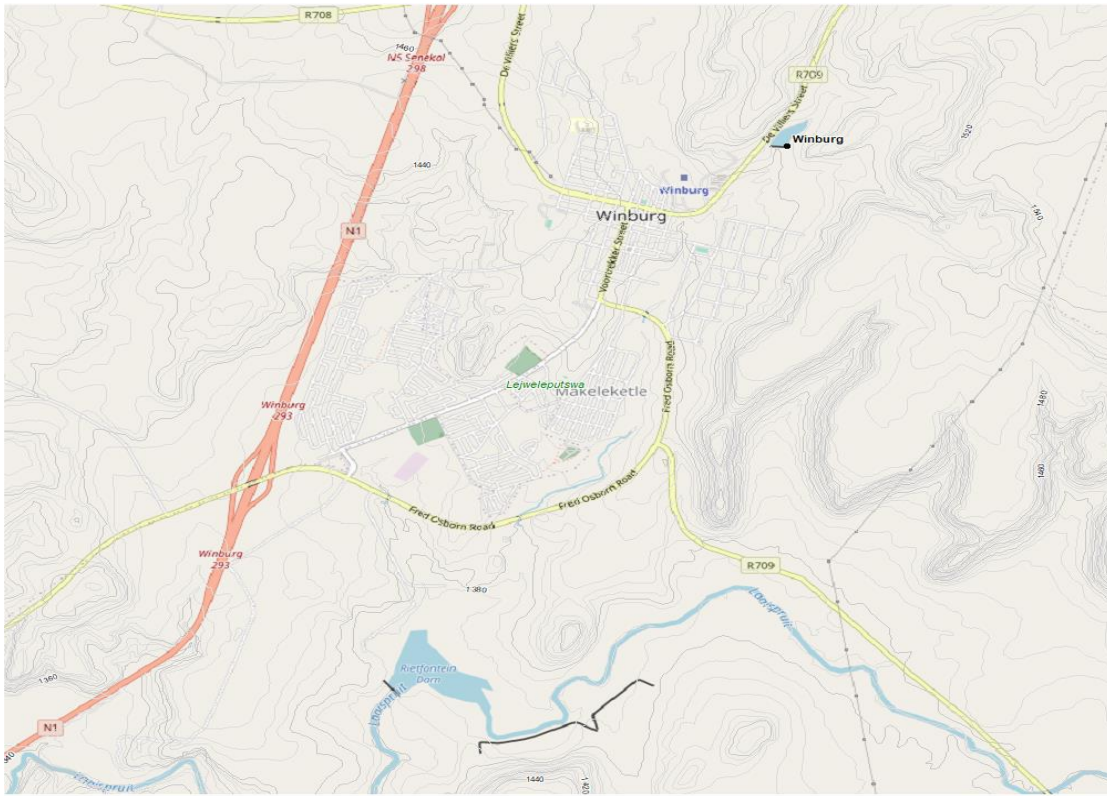


Figure: Locality Map

Image: Winburg Current Site Conditions

VAAL CENTRAL WATER

CONTRACT NO: VCW410/WINWTW/25

UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

ANNEXURE B: ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL MANAGEMENT PLAN

REVISION 0

PROJECT DESCRIPTION: UPGRADE AND REFURBISHMENT OF WINBURG WATER TREATMENT WORKS

Contract Number: VCW410/WINWTW/25

PREPARED FOR

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1. Definitions

Alien Species: Plants and animals, which do not occur naturally in an area – they are brought in by humans. Alien plants often force indigenous species out of the area.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, design alternatives, temporal alternatives or the 'do nothing' alternative.

Best Practicable Environmental Option: The option that provides the most benefits or results with the least damage to the environment as a whole at a cost acceptable to society in the short- and long term.

Conservation: Protecting, using and saving resources wisely, especially the biodiversity found in an area

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g., discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Drainage line: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial and riparian vegetation may or may not be present

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Emissions: The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into the environment (land, surface water, groundwater and air).

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: A plan that organizes and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Expansion: means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

General waste: Waste which does not pose an immediate hazard or threat to health or to the environment' and includes the following waste flows: domestic waste, construction and demolition waste, business waste, insert waste.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Waste that has the potential to cause a negative threat/impact to humans and/or the environment. It includes, but is not limited to, batteries, neon lights, fluorescent lights, printer cartridges, oil, paint, paint containers, oil filters, IT equipment etc.

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Maintenance: means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: As per National Environmental Management: Waste Act means-

a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or

b) disposed of, or that is intended or required to be discarded or disposed of, by the holder of that

substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or

c) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste.

Wetland: land which is transitional between terrestrial and aquatic systems were where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstance support vegetation typically adapted to life in saturated soil.

Watercourse: as per the National Water Act means -

(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows;
(d) and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

2. Purpose

This document describes the main environmental management requirements that the Contractor must comply with during the construction and commissioning phase to ensure that the environment is considered, negative impacts avoided or minimised, and positive impacts enhanced. It also gives details on issues that will be obliging in ensuring effective compliance. This document is critical to the main Contractor and the Contractor's Environmental Officer (EO) as well as any sub-contractors reporting to the main Contractor.

The purpose of this Document is to:

- Describe how project environmental risks will be managed during the construction phase;
- Detail the roles and responsibilities of all parties with respect to environmental management during construction;
- Outline the organisational structure for effective implementation of CEMP;
- Assist the Contractor in understanding the requirements of comply with the CEMP and any relevant specifications; and
- Provide a set of standards for environmental management during the construction phase.

3. Scope of Application

The standard applies to Contractors that will work on site under the authority of the Vaal Central Water. The EMPr is a lifecycle document for the project and considers the mitigation of detrimental impacts as per National Environmental Management principles. This document will act as a legally controlling document to the service providers/ contractors and sub- contractors working on site throughout to the operational phase of the development. This document should be implemented by the developer as well as all service providers/contractors and subcontractors appointed must be obliged to apply the principles set out in this document. In the event of environmental damage caused by any action, process or negligence by the developer, service providers / contractors and sub- contractors, it is the responsibility of the person who caused the damage to rectify and rehabilitate the affected environment at own cost, in line with the 'polluter pays' principle and be liable for any fines issued by the authorities.

4. Abbreviations/Definitions

CEMP	Construction Environmental Management Plan.

Contractor	The Principal Contractor as engaged by Vaal Central Water for infrastructure construction operations, including all sub-contractors appointed by the main contractor for the execution of parts of the construction operations
Contractor's Environmental Officer	Contractor's Environmental Officer responsible for ensuring compliance with the CEMP on a daily basis.
ECO	Environmental Control Officer (ECO). Independent environmental officer who monitors compliance with the CEMP.
Environment	Surroundings in which the Contractor operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations.
Environmental Aspect	Element of a Contractor's activities, products or services that can interact with the environment and cause an environmental impact (e.g. dust, noise etc.)
Environmental Impact	Any chance to the environment, whether adverse or beneficial, wholly or partially resulting from a Contractor's activities, products or services.
Environmental Risk	The product of the likelihood and severity of an unforeseen occurrence/ incident/ aspect and the impact it would have, if realised, on the environment.
SES	Standard Environment Specification which describes a set minimum environmental standards for all construction sites.
Project Manager	Means the overall project manager responsible for implementation of the project.
Environmental Manager	Works together with the Project Management and Engineer to ensure that the requirements of the CEMP/SES are met.
Engineer	Works together with the Project Manager to ensure that construction proceeds in accordance with the relevant specifications and agreed schedule.
Environmental Officer	Person responsible for ensuring that the CEMP is implemented by the project/construction team and Contractors and their Sub-contractors.

5. Overview of the Construction Environmental Management Plan

It is the goal of the developer to implement sustainable environmental management practices throughout all project stages. This will apply to the planning, design, construction, operation, restoration, reuse and decommissioning activities related to all infrastructure development. The CEMP is the tool used to ensure this goal is achieved during the construction and commissioning phases. Some decommissioning may occur during site clearing in brownfield sites and this CEMP will also apply to those activities.

The CEMP has been developed in line with the requirements of all relevant South African Environmental Legislation and Standards of Best Practice.

5.1. Applicable Legislation

Several laws and regulations apply to the protection of the environment and contain environmental principles and standards that need to be applied and permits and licences that need to be obtained. This EMPr will be subject to regulatory control under a range of State, Provincial and Local regulations. Such legislation largely embraces pollution prevention, resource use and conservation, and socio cultural (heritage) protection. This chapter reviews legislation pertaining to the proposed development.

Key environmental legislations that are applicable to the project are listed below, but are not limited to;

- National Environmental Management Act (Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act (Act 10 of 2004)
- National Water Act (Act No. 36 of 1998)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- National Environment
- Management Protected Areas Act, 2003 (Act No. 57 of 2003).
- National Environmental Management: Air Quality Act, Act 39 of 2004
- National Heritage Resources, Act 25 of 1999
- Occupational Health and Safety Act (No 85 of 1993)

6. Roles Responsibilities & Organizational Structure

6.1. Environmental Management: Roles and Responsibilities

6.1.1. Project Manager (PM)

The PM will be responsible for ensuring that the CEMP and associated specifications or requirements are complied with during construction.

The specific tasks during the construction and commissioning stage will include:

- Liaison with the authorities.
- Ensure environmental criteria are incorporated in tenders during tender evaluation and adjudication thereof.
- Review all reports from the Environmental Specialist/Officer, including sign off on Methods Statements.
- Conduct any environmental incident enquiries.
- Identify, with support from the Engineer, the need for corrective or remedial measures with regards to proposed works.
- Ensure induction material includes project appropriate environmental issues.
- Approve training programmes and other awareness initiatives.
- Coordinate or facilitate internal environmental audits.
- Prepare environmental monitoring protocols.

6.1.2. Engineer

The Engineer has overall responsibilities for environmental management on site which includes the implementation of the CEMP, SES, permits and licenses and reports to the Project Manager. The Engineer is supported by the PM.

The specific environmental tasks during the construction phase will include:

- Reviewing the monthly reports compiled by the Environmental Officer.
- Communicating directly with the Contractors.
- Issuing non-conformance notification to Contractors that do not comply with the requirements of the CEMP and associated requirements or documents, including EAs, EMPr, permits and licenses.

6.1.3. Environmental Control Officer

The Environmental Control Officer reports to the Engineer and PM and is responsible for conducting the tasks required to ensure that the CEMP and SES including permits and licences are implemented on the construction site.

The Environmental Control Officer will conduct the following tasks:

- Ensure that environmental issues receive adequate attention in the site induction training.
- Prepare and conduct awareness training (e.g. posters, tool box talks and signage).
- Conduct monthly observation & inspections and audit of all work places.
- Monitor the Contractor's compliance with the EA, EMPr, CEMP and any permits and licences on site.
- Conduct monthly observations and environmental audits of all Contractor's and work areas.
- Ensure that all environmental monitoring programmes (sampling, measuring, recording etc. when specified) are carried out according to protocols and schedules.
- Measurement of completed work (e.g. areas top soiled, re-vegetated, stabilised etc.).
- Maintain site documentation related to environmental management (permits, CEMP, method statements, EA, reports, audits, monitoring results, receipts for waste removal etc.). Documentation to be maintained on the relevant site Document Control System.
- Attendance at scheduled SHE meetings and project coordination meetings.
- Inspect and report on environmental incidents and check corrective action.
- Keep a regular photographic record of all environmental incidents.
- Implementation of environmental-related actions arising out of the minutes from scheduled meetings.
- Management of complaints register.
- Review and Sign off Method Statements prepared by Contractor's.
- Audit Environmental Method Statements.
- Collate information received including monitoring results into a monthly report to the Engineer showing progress against targets.
- The compilation of the Project Environmental Management File.

The key deliverables will include the compilation of:

- Project Start Up Checklist
- Monthly inspection/ environmental audit report
- Monitoring results
- Site close-out reports

- Incidents reports
- Environmental Incident Register
- Environmental Non-Conformance Register
- Complaints Register
- Method Statements Register
- Hazardous Substances Register
- Site Close-out Inspection

6.1.4. Contractor`s Environmental Officer

Contractor will appoint an Environmental Officer whose role is to ensure implementation of the CEMP and SES where applicable. The Contractor will submit the name and CV of the Environmental Officer as well as an Environmental Plan detailing roles and responsibilities with their tender submission. This will be for the ECO's approval and no work can commence on site if this has not been done.

The Contractor's Environmental Plan will include, but not be limited to:

- Description of environmental management responsibilities of the Contractor's Project Manager, Contractor's Site Manager and the Contractor's Environmental Officer
- Organisational Environmental Policy
- Environmental Method Statements
- CEMP
- SES

The Contractor's Environmental Officer will liaise with the Environmental Control Officer on site. It will be the responsibility of the Contractor's Environmental Office to ensure that all work is conducted according to approved Environmental Method Statements and that the roles and responsibilities as set out in this document are fulfilled. The Contractor's Environmental Officer tasks will include:

- Daily, weekly and monthly inspections of the work area(s) as per schedule or authorise through written instruction by the Engineer or Environmental Control Officer. The Contractor is referred to Section 8 for an example of the items that will need to be inspected, and which items will be audited by the Environmental Control Officer.
- Prepare activity/aspect based Environmental Method Statements.
- Identify local, provincial and national environmental legislation that applies to Contractor's activities.
- Monitor compliance with the CEMP, SES and Environmental Method Statements.
- Ongoing Environmental Awareness training of the Contractor's site personnel.
- Reporting, investigating and recording of any environmental incidents caused by the Contractor or due to the Contractor's activities, including their sub-contractors.
- Close out of environmental incidents.
- Attendance at all SHE meetings and induction programmes, and toolbox talks where possible.
- Waste Management.
- Ensure that environmental signage and barriers are correctly placed.
- Taking required corrective action within specified time frame.

The Contractor's Environmental Officer will be expected to submit daily, weekly and monthly checklists to the Environmental Control Officer.

Should the Contractor's Environmental Officer change from that person identified during either tender stage, or construction period, the Contractor will submit a CV of a replacement Environmental Officer for approval by the Environmental Control Officer and Engineer. No Work can proceed until the replacement Environmental Officer has been approved.

6.2. Organizational Structure

The organisational structure identifies and defines the responsibilities and authority of the various entities involved in the project. All instructions and official communications regarding environmental matters will follow the organisational structure defined in this document.

All instructions that relate to the CEMP will still be given to the Contractor via the Engineer. In an emergency situation, however, the Environmental Control Officer may give an instruction directly to the Contractor. Environmental Management of the site will be an item on the agenda of the monthly site meetings and the Environmental Control Officer will attend these meetings. If at any time the Engineer is uncertain in any way with respect to an environmentally related issues or any specification in CEMP, he will consult with the Environmental Control Officer.

6.3. The Contractor

The Contractor will comply with the requirements of the CEMP and abide by the Engineer`s instructions regarding the implementation of the CEMP.

The Declaration of Understanding, as detailed in Section 7, must be signed, and a signed copy must be submitted to the Engineer prior to the start of construction.

Section 7 details some of the main actions required by the Contractor at various stages during the contract. The Environmental Control Officer will monitor that all of these actions are undertaken in accordance with the CEMP.

It must be noted, however, that Section 7 does not list all the requirements of the CEMP, but rather serves as a guide as to where definite actions are required before certain activities can commence. It should be read in conjunction with the SES.

Section 8 contains aspects that will be subject to regular inspections and audits by the various parties.

7. Matters Pertaining to Implementation of the CEMP

7.1. Availability of the CEMP

Copies of the relevant CEMP documentation (SES and any Contractor`s Guideline Documents) will be available at the site offices of the Contractor and/or on site.

7.2. Project Environmental Management Plan

The Contractor is required to submit an Environmental Management Programme (EMPr) with his Tender Documents. The EMPr should describe the relevant roles and responsibilities and how potential environmental risks will be assessed and managed including the monitoring and recording thereof. These will be used to establish a Contractor`s competency and experience of preventing and managing potential environmental impacts.

7.3. Environmental Method Statements

Environmental Method Statements are written submissions by the Contractor to the Engineer and Environmental Control Officer describing:

- The proposed activity, setting out the plant, equipment, materials, labour and method the Contractor proposes using to carry out an activity.
- Transportation of the equipment to and from the site.
- How the equipment/material will be moved while on site.
- How and where material will be stored.
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur.
- Timing and location of activities.
- Description of potential positive and negative environmental impacts and how they will be managed.
- Compliance/non-compliance with the Standard Environmental Specification and any other statutory and best practice standards.
- Monitoring and reporting requirements.
- Any other information deemed necessary by the Engineer.

The Contractor will compile Activity-/Aspect-based Environmental Method Statements for all activities proposed. The Environmental Method Statements will enable the potential positive and negative environmental impacts associated with the proposed construction activity to be identified and mitigation measures put in place. All method statements must be signed by the Contractor, thereby indicating that the works will be carried out according to the methodology described therein.

Activities may only commence once the Environmental Method Statements have been approved by the Environmental Control Officer and Engineer. In some instances, local authorities may also need to approve the method statements. This will be highlighted in the Project Environmental Specification, if applicable.

All changes to the original Method Statements must be approved by the Environmental Control Officer and Engineer prior to implementation. The Contractor will also be required to re-sign the amended Environmental Method Statement.

To enable timely approvals, the environmental method statements will be submitted to the Engineer and Environmental Control Officer for review two weeks prior to the intended date of commencement of the activity, or as directed by the Engineer.

Where changes to the work methodology are proposed, Environmental Method Statements must be amended accordingly and signed off by all relevant parties as indicated above. This Environmental Method Statements MUST contain sufficient information and detail to enable the Engineer and Environmental Control Officer to apply their minds to the potential impacts of the works on the environment. The Contractor will also need to thoroughly understand what is required of him/her in order to undertake the works.

The initial Environmental Method Statements required for submission and approval are listed in this environmental specification. Others may be requested by the Engineer and Environmental Control Officer during the Contract.

7.4. Environmental Incidents and Non-Conformances

In the event of an environmental incident, the Contractor will follow the following procedure:

- Step 1: Immediately take all reasonable measures to contain and minimise the effects of the incident, including its effect on the environment and any risks posed by the incident to the health, safety and property of persons.
- Step 2: Notify the Environmental Control Officer in writing including the following information: the nature of incident and initial classification; substances involved with quantities; initial measures taken to minimise impacts; causes of the incident; measures taken and proposed to avoid the reoccurrence of the incident;
- Step 3: Include the incident on the ECO's Incident Register.
- Step 4: Undertake clean-up procedures.
- Step 5: Remedy the effects of the incident; and
- Step 6: Assess the immediate and long-term effects of the incident on the environment and on public health.

In the event of any level 1 or 2 environmental incidents, the Contractor's Environmental Officer must complete the Environmental Control Officer Incident Report.

In the event of any Level 1 or 2 environmental incidents, the Environmental Control Officer will:

- Ensure that an Incident Flash Report has been compiled and that it contains the necessary information.
- Ensure that the Contractor has complied with Sections 6.1 and 6.2 of the Occurrence Reporting and Investigation Procedure; and
- Report, record, investigate and analyse the incident and communicate the required action plans to be implemented to the Engineer as specified in Section 6.6 of the above-mentioned procedure.

An environmental incident is classified under four levels: 1, 2, 3, and 4 defined as follows:

7.4.1. Level 1 Environmental Incident

An incident of sequel of incidents, whether immediate or delayed, that result or has the potential to result in:

- A significant impact on the physical or biological environment (air, ground, water and habitat) with extensive or long-term impairment of ecosystem function or surface and ground water resources.
- An inconvenience/disturbance/disruption/annoyance (including odour, dust, noise, traffic problem, loss of water supply) of a long duration or with a long-term impact on interested and affected parties. A release of material (gas, liquid or solid) or energy that will cause chronic illness, permanent lost time injury, fatality or extensive property damage experienced by interested and affected parties.
- Irreparable damage to highly valued structures and sacred locations.
- Public or national / international media outcry.
- Instances where inspections undertaken by or for the regulator to check legal compliance, were found to be outside the permitted limits and have resulted in prosecution.
- Any incident with NEMA section 30(1) – and/or NWA section 20(1) reporting requirements (In the event where all administrative requirements have been complied with and the incident has been closed out by the authorities, it may be re-classified as a lower-level incident)

Where the environmental impact of a Level 2 environmental incident is still present 120 days after occurrence, the incident will be reclassified as a Level 1 incident.

Note: A level 1 environmental incident usually should be reported to the authorities, usually result in a significant pollution and may entail risk of public danger. Level 1 environmental incidents usually cause an irreversible impact even with the involvement of long-term external intervention i.e. expertise, best available technology, remedial actions, excessive financial cost etc.

7.4.2. Level 2 Environmental Incident

An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in:

A moderate impact on the physical or biological environment (air, ground, water or habitat) with limited impairment of ecosystem function and/or surface and ground water resources.

- An inconvenience disturbance/disruption/annoyance (including odour, dust, noise, traffic problems, loss of water supply) of moderate or with medium effect on interested and affected parties.
- A release of material (gas, liquid, solid) or energy that causes severe but reversible illness, non-lost time injury or moderate property damage experienced by interested and affected parties.
- Damage to rare structures of cultural significance or significant infringement of cultural values / sacred locations.
- Attention from local media or widespread complaints.
- Instances where inspections undertaken by or for the regulator to check legal compliance have been outside the permitted limits and an official pre-directive or directive was issued.
- Inability of Contractors to close out corrective actions without proper reason.

Where the environmental impact of a Level 3 environmental incident is still present 3 days after occurrence, the incident will be reclassified as a Level 2 incident.

Note: A level 2 environmental incident may be reported to the authorities, can result in significant pollution or may entail risk of public danger. The impact of Level 2 environmental incidents should be reversible within a short to medium term with or without intervention.

7.4.3. Level 3 Environmental Incident

An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in:

- A minor impact on the physical or biological environment (air, ground, water or habitat), with no significant or long-term impairment to the ecosystem function or surface/ ground water resources.
- An inconvenience / disturbance / disruption / annoyance (including odour, dust, noise, traffic problem, loss of water supply) of short duration and with no long –term effect on the employees and the community.
- A release of material (gas liquid, solid) or energy that has the potential to cause illness, or that causes short term discomfort or reversible health effect to be interested and affected parties.
- Isolated complaints by interested and affected parties.
- Instance where inspections undertaken by or for the regulator to check for legal compliance have been outside the permitted limits and an official pre-directive or directive was issued.
- Blatant negligence of the CEMP & SES leading to the issuing of an NCR

NOTE: A level 3 environmental incident is not reportable to authorities, should not result in pollution and may not have a risk of public danger. The impact of Level 3 environmental incidents should be insignificant immediately after occurrence and/or once-off intervention on the day of occurrence.

7.4.4. Level 4 Environmental Incidents

A minor incident with lesser significance that did not necessarily result in damage or injury but that had the potential to cause damage to the environment, including:

- Could result in service disruption with a lesser significance.
- Did not necessarily result in damage.
- Had the potential, under different circumstances, to cause major damage to the environmental.

Or:

Instances where inspections undertaken internally by the ECO to check for conformance with their Environmental Government Framework have been outside the required limits (e.g. an environmental compliance score of less than 80%).

7.4.5. Non-Conformances

A non-conformance may be issued to the Contractor by the Resident Engineer/Environmental Control Officer where:

- The incident response procedure described above (include administrative requirements) were not successful implemented; or
- There are repeated incidents because of inadequate environmental practices on site.
- Documentation required to comply with the CEMP is not prepared or maintained adequately on site; or
- Any non-compliance with the requirements of the Environmental Authorisations, the CEMP and Environmental Specifications are identified.

7.5. Documentation and Records

The Environmental Control Officer will ensure that the Contractor's Environmental Officer is supplied with all required/applicable documents listed in the ECO's Contents for Contractors Environmental File.

The Contractor's Environmental Officer will complete and maintain copies of all documents and records and ensure that these documents and records are kept up to date.

The Contractor's Environmental Officer will submit these documents to the Environmental Control Officer on a monthly basis except where documents have remained unchanged in which case written notification to this effect must be provided to the Environmental Control Officer.

Once the Environmental Control Officer has conducted a site closure inspection and notified the Contractor that site closure will be granted, all documents described above must be handed over to the ECO after which a Site Closure Certificate will be issued.

Note: All documents/records are to be retained for a period of 10 years.

8. Main Actions Required by the Contractor to Comply

8.1. Prior to commencement

The Engineer must ensure that the requirements below are requested of the Contractor in the Project Construction Contract Document, the Letter of Appointment and any other relevant correspondence with the Contractor prior to the start of works, as relevant.

8.1.1. Declaration of Understanding (DoU)

The Declaration of Understanding must be signed and provided by the Contractor as part of his Tender Document. The signed DoU is a written confirmation by the Contractor that the requirements of the CEMP are understood and will be complied with for the duration of their works on site.

The proforma DoU to be signed by the Contractor has been included.

8.1.2. Appointment of Contractor's Environment Officer

The Contractor will appoint an Environmental Officer or assign to a competent person roles and responsibilities for environmental management during construction. The Contractor will forward details of the appointment to the ECO for their review and approval. Should the Contractor's Environmental Officer or the person originally assigned with responsibilities for environmental management change from that person identified during either the tender stage, or the construction period, the Contractor will submit the details of such appointment or assignment for the ECO's approval. No working will proceed until the new Environmental Officer is assigned or appointed.

8.1.3. Environmental Management Plans and Method Statements

The Environmental Management Plan and Environmental Method statements must meet the requirements of the CEMP. These include, but are not limited to, the following where applicable:

- Establishment of construction lay down area
- Hazardous and non-hazardous waste management
- Storm water management
- Handling, storage and management of hazardous substances
- Contaminated water management
- Hydrocarbon spills
- Diesel tanks and refuelling procedures
- Dust control
- Spoil dump
- Sourcing, excavating, transporting and dumping of fill material
- Noise and vibration control
- Removal of rare, endemic or endangered species
- Rodent and pest control
- Environmental awareness training
- Site division (demarcation of the site)
- Emergency procedures of environmental incidents
- Closure of construction laydown area

Emergency construction activity Environmental Method Statement may also be required. The activities requiring Environmental Method Statements cannot commence if they have not been approved by the Resident Engineer or Environmental Control Officer.

8.1.4. Environmental Induction

The Contractor must ensure that all management, foremen and the general workforce, as well as all sub-contractors, suppliers and visitors to site have attended the Environmental Induction Programme prior to commencing any work on site. Where new personnel commence work on site during the construction period, the Contractor must ensure that these personnel also undergo the Induction Programme and are made aware of the environmental specifications on site. The Contractor must ensure that all of their personnel understand the requirements of the EMPr as relevant to their scope of work.

8.2. During the construction period

8.2.1. Copy of the CEMP and familiarisation thereof

A copy of the EMPr must be available on site and the Contractor will ensure that all personnel on Site (including sub-contractors and their staff) as well as suppliers are familiar with and understand the specifications contained in these documents.

8.2.2. Compliance with the EMPr

Compliance with ensure that all sections of the EMPr (where relevant) must be compiled with during the construction period.

8.2.3. Site Clean-Up for Closure

Retention moneys will not be paid until a Site Closure Inspection (conducted by the Environmental Control Officer) has taken place and signed off by the Engineer and PM together with the Site Closure Certificate.

9. Environmental Inspections and Audits

Environmental inspections and audits shall be conducted using five basic techniques:

- Interviews with Contractor's staff including sub-contractors and suppliers;
- Document checks ;
- Observations;
- Monitoring; and
- Measurement and verification.

For each construction project, the auditor and auditee are as follows:

Place	Inspector / Auditor	Auditee	Inspection/audit Frequency
Work places	Contractor's Environmental Officers	Contractor's Team	Daily/Weekly Inspection
Construction Site	Environmental Control Officer	Contractor's Environmental	Monthly Audit

		Officer	
Construction Site (Entire area)	Environmental Specialist	Entire Project	As required

9.1. Workplaces Inspection

The Contractor's Environmental Officer will be required to conduct weekly inspections of all work places for which the Contractor is responsible, including but not limited to the following:

- Contractor's camp, recreational and canteen facilities
- Material lay down areas
- Liquid and solid waste storage facilities(general, hazardous, recycling and scrap)
- Workshops
- Oil traps
- Wash bays
- Construction work area
- No-go areas
- Storm water drains
- Any other construction area for which the SHE officer is responsible.

At each of these sites, the Contractor's Environmental Officer will be required on a daily basis to check for the following, where relevant:

By Observation:

- Litter
- Separation of solid waste as per system
- Hydrocarbon spills
- Effectiveness of dust control measures
- Illegal washing out of containers in drains
- Correct usage and wastage
- Pollution of rivers / watercourses
- Provision and use of toilet facilities
- Any other illegal activities

By Document check:

- Removal of oil for recycling as per schedule
- Removal of packaging as per agreements with suppliers
- Removal of hazardous waste by specialist Contractors as per schedule
- Correct placement of environmental signage and posters
- Document board listing emergency numbers, hazmat info sheet, etc.

The following records must also be kept up to date (information must include that of sub-contractors where relevant):

- Fuel consumption for entire contract measured in litres (including plant, generators, other equipment, vehicles etc.)
- Electricity consumption for entire contract measured in Watt hours.
- Quantities of general waste submitted for recycling measured in kilograms
- Quantities of general waste disposed of to landfill measured in kilograms
- Quantities of hazardous waste disposed of to landfill measured in kilograms
- Water consumption, including water used for construction and human consumption measured in litres.

9.2. Construction Site Audit

The Environmental Control Officer will be required to conduct monthly inspections of the entire construction site, which may involve more than one Contractor and may include, but not be limited to the following:

- Entire site
- Fencing
- Environmentally sensitive areas
- Contractor's camp, recreational and canteen facilities
- Material lay down areas
- Scrap yard
- Workshops
- Oil traps
- Wash bays
- Sewage plant
- Quarries and borrow pits used for fill and construction material
- Spoil dumping areas
- Solid waste disposal areas
- Liquid waste disposal areas
- Bioremediation site
- Area for the temporary storage of hazardous waste
- Fuel depot and hydrocarbon storage areas
- Construction work area
- Concrete batching plant
- Spray booths
- Haul roads
- No-go areas
- Storm water drains
- And any other construction areas not listed

At each of these sites, the Environmental Control Officer will be required to check for the following, where relevant:

By Observation:

- Litter
- Separation of solid waste per system
- Hydrocarbon spills
- Use of bunding, hard standing and other protection measures
- Illegal dumping
- Effectiveness of dust control measures
- Illegal washing out of containers in drains
- Wash bay drainage systems are working
- Correct usage of drip trays
- Effectiveness of oil separators
- Illegal use of tracks and off-road driving in no-go areas
- Correct procedures are followed for topsoil removal and stockpiling
- Effectiveness of erosion protection measures
- Excess noise and vibration
- Water use and wastage
- Pollution of rivers / watercourses
- Provision and used of toilet facilities
- Any other illegal

By Document check:

- All receipts for the collection of old oil, general recycled waste and hazardous waste
- Correct placement of environmental signage and posters
- Document board list emergency numbers, hazmat info sheets, etc.
- Complete and accurate record of Contractor’s Environmental File

By Measurement:

- Amount of water used by each Contractor (where practical)
- Amount of topsoil removed and stockpiled
- Amount of land stabilisation completed
- Area re-vegetated
- Amount of waste recycled, sent to scrap yard or disposed in dump
- Amount of material treated in the bioremediation site

By Monitoring:

- Effectiveness of dust control systems
- Effectiveness of pollution control systems
- Effectiveness of rehabilitation and re-vegetation programmes
- Effectiveness of noise control barriers

A site-specific inspection checklist will be provided to the Environmental Officer prior to site establishment and a specific site audit protocol will be formulated.

The Contractor will be required to achieve the minimum requirement for environmental audits. The standard/minimum requirement for all environmental audits is 90% and where a compliance score of less than 90% has been achieved, nonconformance reports (NCRs) will be issued to the Contractor.

10. Records

All environmental records/documents generated during the construction phase of the project will be managed in terms of Vaal Central Water's Document Management Procedure for records retention.

11. Overview of the Standard Environmental Specifications (SES)

This procedure describes the minimum standards for environmental management to which Contractors and sub-contractors on a construction site must comply. It is a generic standard for use across all construction works executed by Vaal Central Water.

This document must be read in conjunction with the Construction Environmental Management Plan (CEMP).

11.1. Standards for Environmental Management

The Contractor shall identify the potential environmental impacts that may occur as a result of his/her activities and accordingly prepare separate Method Statements describing how each of these impacts will be prevented or managed so that the standards set out in this document are achieved. These Method Statements will be prepared in accordance with the requirements set out in the CEMP.

The Contractor will comply with the standards described below.

11.1.1. Site Planning and Establishment

The Contractor shall establish his construction camps, offices, workshops, staff accommodation and any other facilities on the site in a manner that does not adversely affect the environment. These facilities must not be sited close proximity to sensitive areas.

11.1.1.1. Site Plan

Before the onset of construction, the Contractor shall submit to the Engineer and ECO for approval, plans of the exact location, extent and construction details of these facilities and the impact mitigation measures the Contractor proposes to put in place.

The Site Plan must as a minimum include but not be limited to:

- Detailed layout of the construction works areas including access roads, site offices, material laydown areas, temporary stockpile areas and parking areas.
- Detailed locality and layout of all waste storage and handling facilities for litter, kitchen refuse and workshop-derived effluents.

- Proposed areas for the stockpiling of topsoil and excavated spoil material.
- Demarcation of the construction footprint including areas not to be disturbed by the development.
- Location of sewage and sanitary facilities at the site offices and staff accommodation and all localities on the site where there will be a concentration of labour. Sanitary arrangements should be to the satisfaction of the Engineer
- The site offices should not be cited in close proximity to steep areas. It is recommended that the offices, and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpile be located as far away as possible from any watercourse as possible.

11.1.1.2. Identification and Establishment of Suitable Access Routes/Roads

Existing access routes to the construction/works area must be used as far as possible. The building of access roads must be restricted to within the development footprint to prevent unnecessary disturbance of the surrounding environment. Access tracks must be maintained in a good condition at all times during construction to minimise erosion and dust generation.

11.1.1.3. Demarcation of Site Limits

Prior to the commencement of construction, the actual site to be developed must be clearly demarcated by means of highly visible barriers such as fences and orange snow netting. Vegetation within the demarcated zone may be cleared. Disturbance of vegetation outside of the demarcated development footprint is not permitted.

All plant, material and equipment required for construction must be located within the designated areas. Laydown areas must be clearly demarcated within the site limits. No activities are allowed outside of the demarcated development footprint.

11.1.1.4. Eating Areas

The Contractor is responsible for providing temporary shade areas within the works area to ensure that workers do not leave the site to eat during working hours. Refuse bags must be provided at all established eating areas.

11.1.1.5. Effluent Management

All effluent water from site shall be disposed of in a properly designed and constructed system, situated so as not to adversely affect water courses (streams, rivers, pans, dams, etc.) Only domestic type wastewater shall be allowed to enter the designated system.

11.1.2. Sewage and Sanitation

The Contractor is responsible for providing adequate sanitary facilities to all workers on site and for enforcing the proper use of these facilities. Safe and effective sewage treatment will require one of the following sewage handling methods: septic tanks and soak-aways, dry-composting toilets such as “enviro loos”, or the use of chemical toilets which are supplied and maintained by a suitably qualified sub-contractor. The type of sewage treatment will depend on the location of the site and the surrounding land uses, the duration of the contract and proximity (availability) of providers of chemical toilets. Should a soak-away system be used, it shall not be

closer than 100 metres from any natural water course or water retention system. The waste material generated from these facilities shall be serviced on a regular basis.

Toilets and latrines shall be easily accessible and shall be positioned within walking distance from wherever employees are employed on the works. Use of open area (i.e. the veldt) shall not, under any circumstances, be allowed.

Outside toilets shall be provided with locks and doors and shall be secured to prevent them from blowing over. The toilets shall also be placed outside areas susceptible to flooding and high winds. The Contractor shall arrange for regular emptying of toilets and shall be entirely responsible for enforcing their use and for maintaining such facilities in a clean, orderly and hygienic condition to the satisfaction of the Engineer.

The Contractor shall ensure that there are separate toilet facilities for male and females on site at a ratio of one facility for every 10 employees.

11.1.3. Waste Management

Waste is grouped into “general” or “hazardous”, depending on its characteristics. The classification determines handling methods and the ultimate disposal of the material.

General waste to be expected during construction includes the following;

- Trash (wastepaper, plastics, cardboard, etc.) and food waste from offices, warehouses and construction personnel
- Uncontaminated construction debris such as used wood and scrap metal
- Uncontaminated soil and non-hazardous rubble from excavation or demolition

Hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to its inherent physical, chemical characteristics, such as toxic, ignitable, corrosive, carcinogenic other properties or toxicological characteristics of that waste have a detrimental impact on health and the environment.

The Contractor shall classify all wastes expected to be generated during the construction period.

Examples of typical construction waste which could be expected on the site and how they should be classified are indicated in the following table:

Table 1: Example of Construction Waste Classification.

WASTE	CLASSIFICATION	
	HAZARDOUS	GENERAL
Aerosol containers	X	
Batteries, light bulbs, circuit boards, etc.	X	X
Clean soil		X
Construction debris contaminated by oil or organic compounds	X	
Domestic waste		X

WASTE	CLASSIFICATION	
	HAZARDOUS	GENERAL
Empty drums (depends on prior use)	X	X
Empty paint and coating containers		X
Explosive waste	X	
PCB waste	X	
Rubble (not contaminated by oil or organic compounds)		X
Waste cable		X
Waste plastic		X
Waste paint and/or solvent	X	
Waste oil	X	
Waste concrete		X
Waste containing fibrous asbestos	X	
Waste timber		X
Sewerage sludge	X	
Scrap metal		X
Chemically derived sanitary waste	X	

A hierarchical control approach to waste management is encouraged. Waste should preferably be managed in the following order of preference:

1. Avoidance: using goods in a manner that minimises their waste components.
2. Reduction: reduction of the quantity and toxicity of waste generated during construction.
3. Re-use: removing an article from a waste stream for use in a similar or different purpose without changing its form or properties.
4. Recycling: separating articles from a waste stream and processing them as products or raw materials.
5. Recovery: reclaiming particular components or materials or using the waste as a fuel.
6. Treatment: processing of waste by changing its form or properties in order to reduce toxicity and quantity.
7. Disposal: burial, deposit, discharge, abandoning or release of waste.

The Contractor is responsible for the removal of all waste from site generated through the Contractor`s activities. The Contractor shall ensure that all waste is removed to appropriate licensed waste management facilities. (For the identification of an appropriate facility, the following source may be utilized: www.sawic.org.za).

The Contractor shall manage HAZARDOUS WASTE anticipated to be generated by his operations as follows:

- Characterise the waste to determine if it is general or hazardous.
- Obtain and provide an acceptable container with correct classification label.
- Place hazardous waste material in allocated container.

- Inspect the container on a regular basis as prescribed by the Contractor's waste management plan.
- Track the accumulation time for the waste.
- Haul the full container to the disposal site.
- Provide documentary evidence of proper disposal of the waste.

The Contractor`s Environmental Officer will work in conjunction with the Contractor`s construction safety and industrial hygiene personnel to create a Hazardous Materials Management Program. This program will establish the necessary protocol for proper handling and removal of hazardous materials on the site.

Information on each hazardous substance will be available to all persons on site in the form of Material Safety Data Sheets (MSDS). Training and education about the proper use, handling, and disposal of the material will be provided to all workers handling the material.

The Contractor`s Environmental Officer must be informed of all activities that involve the use of hazardous substances to facilitate prompt response in the event of a spill or release.

The Contractor shall manage GENERAL WASTE that is anticipated to be generated by operations as follows:

- Determine if waste is non-hazardous and obtain containers for waste storage.
- Notify waste hauler when container is full so that it can be removed and replaced with an empty.
- No littering is allowed on site. In the event where staff mobility is high, refuse bags will be made available by the Contractor.
- Provide documentary evidence of proper disposal of waste

The Contractor shall recycle GENERAL WASTE (as far as practically possible) that is anticipated to be generated by its operations as follows:

- Obtain and label recycling containers for the following (whichever relevant) and locate within temporary office building and trailers:
  - Office Waste;
  - Aluminium;
  - Steel;
  - Glass;
  - Ferrous Metals; Non-Ferrous Metals; and
  - Waste Timber
- Establish recycled material collection schedule.
- Arrange for full bins to be hauled away.

Spent batteries, circuit boards, and bulbs, while non-hazardous, require separate storage, special collection and handling.

No burning, burying or dumping of waste of any kind will be permitted.

The Contractor shall quantify all waste disposed of, whether general or hazardous (including waste disposed of by any subcontractors) and keep record of these quantities on site.

11.1.4. Workshops, equipment maintenance and storage

Al vehicles and equipment must be kept in good working order to maximize efficiency and minimise pollution. Maintenance, including washing and refuelling of plant on site must be done at designated locations at workshop areas. These designated areas must be agreed with the Engineer and Environmental Control Officer. The Contractor must ensure that no contamination of soil or vegetation occurs around workshops and plant maintenance facilities. All machinery servicing areas must be bunded. Drip trays should be used to collect used oil, lubricants and other during maintenance. Drip trays must be provided for all stationary plant. Washing of equipment should be restricted to urgent maintenance requirements only. Adequate wastewater collection facilities must be provided.

11.1.5. Vehicle and Equipment Refuelling

11.1.5.1. Stationary/Designated Refuelling

No vehicles or machines shall be serviced or refuelled on site except at designated servicing or refuelling locations. No oil or lubricant changes shall be made except at designated locations, or in case of breakdown or emergency repair.

The Contractor shall store fuel and oil at a secure area, which shall be bunded to contain 110% of the total volume within the bund and designed with an impervious layer or liner or paved surface to prevent spillage from entering the ground.

The Contractor shall provide details of its proposed fuel storage and fuelling facility to the Environmental Control Officer for approval. The design shall comply with the regulations of the National Water Act, (Act 36 of 1998), the Hazardous substances Act, (Act 15 of 1973), the Environmental Conservation Act, (Act 73 of 1989), and the Occupational Health and Safety Act, (Act 85 of 1993), mainly the Construction – and Hazardous Chemical Substances Regulations.

11.1.5.2. Mobile Refuelling

In certain circumstances, the refuelling of vehicles or equipment in a designated area is not a viable/practicable option and refuelling has to be done from a tank, truck or container moved around on site. In such circumstances, the Contractor may request approval from the Engineer to conduct mobile refuelling subject to the following control measures:

- Secondary containment equipment shall be in place. This equipment shall be sized to contain the most likely volume of fuel that could be split during transfer.
- Absorbent pads or drip trays are to be placed around the fuel inlet prior to dispensing.
- Mobile refuelling units are to be operated by a designated competent person.
- The transfer of fuel must be stopped prior to overflowing. Fuel tanks or refuelling equipment on vehicles may only be filled to 90% carrying capacity.
- Mobile fuelling tanks must be stored in an area where they are not susceptible to collisions. The fuel storage area must be located away from drainage channels.
- Mobile refuelling operations shall not take place within 15 meter of any residential buildings, or 7.5 meter from other structures, property lines, public ways or combustible storage.
- All mobile refuelling tanks are to be properly labelled and fire extinguishers shall be located near the fuel storage areas. These extinguishers must be of a suitable type and size.

11.1.6. Spill Response

The Contractor shall have adequate spill response materials/equipment on site which must be aligned with the volumes of hazardous substances used on site and the risk of pollution to sensitive environmental attributes.

The Contractor shall provide details for approval by the Engineer of its spill response plan in the event of any spills of fuel, oils, solvents, paints or other hazardous materials. The plan will show measures to be taken in removing contaminated material from site and demonstrate complete removal of contamination.

The Contractor shall instruct construction personnel on the following spill prevention and containment responsibilities:

- Immediately repair all leaks of hydrocarbons or chemicals
- Take all reasonable means to prevent spills or leaks
- Do not allow sumps receiving oil or oily water to overflow
- Prevent storm water runoff from contamination by leaking or spilled drums of oil or chemicals
- Do not discharge oil or contaminants into storm water or sewer systems

If a spill occurs on land, the Contractor must:

- Immediately stop or reduce the spill
- Contain the spill
- Recover the spilled product
- Remediate the site
- Implement actions necessary to prevent the spill from contaminating groundwater or off-site surface water Dispose of contaminated material to a location designated thereto

Any spill to water has the potential to disperse quickly; therefore, the spill must be contained immediately using appropriate containment equipment.

If a spill to water occurs, the Contractor must:

- Take immediate action to stop or reduce the spill and contain it
- Notify the appropriate on-site authorities
- Implement actions necessary to prevent the spread of the contamination by deploying booms and/or absorbent material
- Recover the spilled product
- Properly dispose of spilled material

11.1.7. Spray Painting and Sandblasting

Spray painting and sandblasting should be kept to a minimum. All painting should, as far as practicable, be done before equipment and material is brought on site. Touch-up painting is to be done by hand painting or by an approved procedure. A Method Statement shall be submitted to the Environmental Control Officer for approval.

The relevant Contractor will inform his Environmental Officer of when and where spray painting or sandblasting is to be carried out prior to commencement of work. The Environmental Officer will monitor these activities to ensure that adequate measures are taken to prevent contamination of the soil.

If the area is in confined or high (elevated) area, a protection plan must be issued for approval.

11.1.8. Dust Management

Material in transit should be loaded and contained within the load bin of the vehicle in such a way as to prevent any spillage onto the roads and the creation of dust clouds. If necessary, the bin of the vehicle shall be covered with a tarpaulin to prevent dust.

Dust is to be controlled on unpaved access roads and site roads using sprayed water. Contractors are responsible for managing dust generated as a result of their activities.

Some dust control measures which are normally applied during construction are presented in this section for inclusion by the Contractor in his Dust Control Method Statement:

- Operate vehicles within speed limits, where no speed limit has been specified the limit shall be 20 km/h
- Wash paved surfaces within the construction area twice a week
- Minimise haulage distances
- Apply water to gravel roads with a spraying truck when required
- Environmentally friendly soil stabilisers may be used as additional measures to control duct on gravel roads and construction areas
- Dust suppression measures will also apply to inactive construction areas. (An inactive construction site is one on which construction will not occur for a month or more).
- Construction material being transported by trucks must be suitably moistened or covered to prevent dust generation
- Minimise disturbance of natural vegetation during right-of-way construction (e.g. transmission lines and erection of fences) to reduce potential erosion, runoff, and air-borne dust.
- Implement as system of reporting excessive dust conditions by construction personnel (as instructed through Environmental Awareness Training).

Water for dust control shall only be taken from approved sources.

11.1.9. Storm Water and Dewatering Management

The Contractor shall be aware that, apart from runoff from overburden emplacements and stock piles, storm water can also be contaminated from batch plants, workshops, vehicle wash-down pads, etc., and that contaminants during construction may include hydrocarbons from fuels and lubricants, sewerage from employee ablutions and excess fertiliser from rehabilitated areas, etc.

The Contractor shall take note that discharges to controlled waters such as the sea, rivers, and groundwater or to sewerage systems are controlled under South African Water Legislation.

The following specific measures are required:

- Temporary drainage must be established on site during the construction period until permanent drainage is in place. Contractors are responsible for maintaining the temporary drainage in their areas. Contractors must provide secondary drainage that prevents erosion.
- Contractors must employ good housekeeping in their areas to prevent contamination of drainage water.
- The Contractor shall clear stagnant water.
- The Contractor shall ensure that no contaminated surface water flows off-site as a result of Contractor operations. Silt traps shall be constructed to ensure retention of silt on site and cut-off ditches shall be constructed to ensure no runoff from the site except at points where slit traps are provided. The Contractor shall be responsible for checking and maintaining all silt traps for the duration of the project.
- If applicable, the Contractor shall be responsible for collection, management, and containment within the site boundaries of all dewatering from all general site preparation activities. The dewatering water shall be contained within the site boundaries by sequentially pumping or routing water to and from sub-area within the site as the construction activities precede. No discharge/dewatering to off-site land or surface water bodies will be allowed.
- On-site drainage shall be accomplished through gravity flow. The surface drainage system shall consist of mild overland slopes, ditches, and culverts. The graded areas adjacent to buildings shall be sloped away with a 5 %. Other areas shall have a minimum slope of 0.2% or as otherwise indicated.
- Ditches shall be designed to carry a 25-year storm event with velocities in accordance to minimise erosion. Erosion protection shall consist of suitable stabilising surfaces in all ditches.
- Culverts shall be designed to ensure passage of the 50-year storm peak runoff flow.

11.1.10. Erosion Control

Both structural and non-structural (vegetative) erosion control measures will be designed, implemented, and properly maintained in accordance with best management practices which will include the following:

- Scheduling of activities to minimise the amount of disturbed area at any one time
- Implementation of re-vegetation as early as feasible
- Limiting construction traffic and/or avoidance thereof on access roads and areas to be graded to the extent feasible at drainage ditches
- Compacting loose soil as soon as possible after excavation, grading, or filling
- Using slit fences, geo-textiles, temporary rip-rap, soil stabilisation with gravel, diversionary berms or swales, small sedimentation basins, and gravelled roads to minimise transport of sediment
- Implementing the erosion and sedimentation control plan and ensuring that construction personnel are familiar with and adhere to it
- Managing runoff during construction
- The Contractor shall be responsible for checking and maintaining all erosion and sedimentation controls

11.1.11. Rehabilitation

Contractors shall rehabilitate the entire site upon completion of work. A rehabilitation plan will be submitted to the Engineer for approval at least six weeks before completion. The following are critical issues to be included in the rehabilitation plan:

- Details of soil preparation procedures including proposed fertilisers or other chemicals being considered for use

- A list of the plant species that will be used in the rehabilitation process. Note that these should all be indigenous species, and preferably species that are endemic to the area. The assistance of an appropriately qualified botanist should be sought in developing this list.
- Procedures for watering the planted areas (frequency of watering, methodology proposed, etc.)
- An indication of the monitoring procedures that will be put in place to ensure the successful establishment of the plants (duration and frequency of monitoring, proposed criteria for declaring rehabilitation as being successful).
- Procedures for the prevention of the establishment and spread of alien invasive species.

11.1.12. Noise Management

- Keep all equipment in good working order
- Operate equipment within its specification and capacity and don`t overload machines
- Apply regular maintenance, particularly with regards to lubrication
- Operate equipment with appropriate noise abatement accessories, such as sound hoods
- Sensitive social receptors shall be notified of any excessive noise-generating activities that could affect them
- Ensure that the potential noise source will conform to the South African Bureau of Standards recommended code of practice, SANS 10103:2004, so that it will not produce excessive or undesirable noise when released
- All the Contractor`s equipment shall be fitted with effective exhaust silencers and shall comply South African Bureau of Standards recommended code of practice, SANS 10103:2004, for construction plant noise generation
- All the Contractor`s vehicles shall be fitted with effective exhaust silencers and shall comply with the Road Traffic Act, (Act 29 of 1989) when any such vehicle is operated on a public road
- If on-site noise control is not effective, protect the victims of noise (e.g. earplugs) by ensuring that all noise-related occupational health provisions are met (Occupational Health and Safety Act, (Act 85 of 1993)).

11.1.13. Protection of heritage resources

11.1.13.1. Archaeological Sites

If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery inform the engineer of such a discovery. The South African Heritage Resources Agency (SAHRA) is to be contacted and will appoint an archaeological consultant. Work may only resume once clearance is given in writing by the archaeologist.

11.1.13.2. Graves and middens

If a grave or midden is uncovered on site, or discovered before the commencement of work, all work in the immediate vicinity of the graves/middens shall be stopped and the Engineer informed of the discovery. The National Monuments Council should be contacted and in the case of graves, arrangements made for an undertaker to carry out exhumation and reburial. The undertaker will, together with the National Monuments Council, be responsible for attempts to contact family of the deceased and for the site where the exhumed remains can be re-interred.

11.1.14. Fire Prevention

Fires shall only be allowed in facilities or equipment specially constructed for this purpose. A firebreak shall be cleared and maintained around the perimeter of the camp and office sites. All conditions incorporated in the requirements of the Occupational Health and Safety Act shall be implemented.

11.1.15. Water Protection and Management

No water shall be abstracted form any water resource (stream, river, or dam) without the express permission of the Engineer. Such permission shall only be granted once it can be shown that the water is safe for use, that there is sufficient water in the resource to meet the demand, and once permission has been obtained from the Department of Water Affairs in accordance with the requirements of the National Water Act (Act 36 of 1998).

Water for human consumption shall be available at the site offices and at other convenient locations on site. The generally acceptable standard is that a supply of drinking water shall be available within 200 m of any point on the construction site.

The Contractor shall keep record of the quantities of water used during construction (including use by sub-contractors), irrespective of the purpose of use.

11.1.16. Protection of Fauna and the collection of firewood

On no account shall any hunting or fishing activity of any kind be allowed. This includes the setting of traps, or the killing of any animal caught in construction works.

On no account shall any animal, reptile or bird of any sort be killed. This specifically includes snakes or other creatures considered potentially dangerous discovered on site. If such an animal is discovered on site an appropriately skilled person should be summoned to remove the creature from site. Consideration should be given to selection and nomination of such a person prior to site establishment. If no-one is available, training should be provided to at least two site staff members.

The Contractor shall provide adequate facilities for all his staff so that they are not encouraged their comforts on site by accessing what can be taken from the natural surroundings. The Contractor shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

11.1.17. Environmental Awareness Training

An Environmental Awareness Program is considered a necessary part of the Construction Environmental Management Plan for the Project. Training of the appropriate construction personnel will help ensure that all environmental regulations and requirements are followed which must be defined in the relevant Method Statement to be prepared by the Contractor.

Objectives of environmental awareness training are:

- Environmental Management – protecting the environment from the effects of construction by making personnel aware of sensitive environmental resources.
- Regulatory compliance – complying with requirements contained in project-specific permit conditions, also complying with requirements in regional and local regulations.
- Problem recognition and communication – training personnel to recognise potential environmental problems, i.e. spills, and communicate the problem to the proper person for solution.

- Liability control – non-compliance with regulatory requirements can lead to personal and corporate liability.

All individuals on the Project construction site will need to have a minimum awareness of environmental requirements and responsibilities. However, not all need to have the same degree of awareness. The required degree of knowledge is greatest for personnel in the Safety, Health and Environmental Sections and the least for the manual personnel.

The Contractor shall present environmental awareness programmes on a weekly/bi-monthly basis and keep record of all the environmental related training of the personnel.

11.1.18. Handling and Batching of Concrete and Cement

Concrete batching shall only be conducted in demarcated areas which have been approved by the Engineer.

Such areas shall be fitted with a containment facility for the collection of cement-laden water. This facility shall be bunded and have an impermeable surface protection so as to prevent soil and groundwater contamination. Drainage of the collection facility will be separated from any infrastructure that contains clean surface runoff.

The batching facility will not be placed in areas prone to floods or the generation of stagnant water. Access to the facility will be controlled to minimise potential environmental impacts.

Hand mixing of cement and concrete shall be done on mortarboards and/or within the bunded area with impermeable surface or concrete slab.

Bulk and bagged cement and concrete additives will be stored in an appropriate facility at least 10 m away from any watercourse, gullies and drains.
Wastewater collected in the containment facility shall be left to evaporate. The Contractor shall monitor water levels to prevent overflows from the facility. Water can be pumped into sealed drums for temporary storage and must be disposed of as liquid hazardous waste.

All concrete washing equipment, such shovels, mixer drums, concrete chutes, etc. shall be done within the washout facility.
Water used for washing shall be restricted as afar as practically possible.

Ready-mix concrete trucks are not allowed to wash out anywhere other than in an area designated for this purpose.

The Contractor shall periodically clean out hardened concrete from the wash-out facility or concrete mixer, which can either be reused or disposed of as per accepted waste management procedures.

Empty cement and bags, if temporarily stored on site, must be collected and stored in weatherproof containers. Used cement bags may not be used for any other purpose and must be disposed of on a regular basis in accordance with the Contractor`s solid waste management system.

Sand and Aggregates containing cement will be kept damp to prevent the generation of dust.

Concrete and cement or any solid waste materials containing concrete and cement will be disposed of at a registered disposal facility. Where disposal facilities for general waste are utilised, written consent from the relevant municipality must be obtained.

11.1.19. Stockpiling, Soil Management and Protection of Flora

Clearance of vegetation shall be restricted to that which is required to facilitate the execution of the works.

Stockpiling may only take place in designated areas indicated on the approved site layout plan. Sensitive areas shall be avoided in this regard.

The Contractor shall measure the extent of all areas cleared for construction purposes and keep this figure updated.

Any area to be used for stockpiling or material laydown shall be stripped of all topsoil.
Vegetation clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible.

The detail of vegetation clearing shall be subject to the Engineer`s approval and shall occur in consultation with the Environmental Control Officer.

Stockpiles must be positioned in areas sheltered from the wind and rain to prevent erosion and dispersion of loose materials.

Stockpiled soil shall be protected by adequate erosion-control measures.

Soil stockpiles shall be located away from drainage lines, watercourses and areas of temporary inundation.

Topsoil shall be stockpiled separately from other materials and kept moist.

Excavated subsoil, where not contaminated, must be used for backfilling and topsoil for landscaping and rehabilitation of disturbed areas.

Where topsoil has become mixed with subsoil or is not up to the original standard, fertiliser or new topsoil shall be provided by the Contractor.

Stockpiles (excluding ballast stockpiles) shall not exceed 2 m in height unless otherwise permitted by the Engineer.

No vegetation located outside the construction site shall be destroyed or damaged.

As far as is reasonably practicable, existing roads must be used for access to site and right of way.

Before site clearance takes place, vegetation surveys will be conducted and protected species identified.

No protected plant species shall be removed without written consent from the relevant authorities.

The development of new embankments or fill areas must be undertaken in consultation with the Environmental Control Officer.

No dumping of solid waste or refuse shall be allowed within or adjacent to areas of natural vegetation.

The Contractor shall identify and eradicate all declared alien and invasive plant species occurring on site.

11.1.20. Traffic Management

Vehicles are not permitted to leave access roads.

Turning of vehicles should only take place within a clearly demarcated “turn area” located within the approved construction footprint.

The Contractor must co-ordinate the loading and offloading of material during the construction phase so as to ensure that vehicular movement is in one direction only at any on time and that side-tracks are not created on the site.

Vehicles should only be parked within designated parking areas as demarcated on the site layout plan.

11.1.21. Transportation of Materials

The Contractor is responsible for ensuring that all suppliers and delivery drivers are aware of procedures and restrictions (e.g. no-go areas) in terms of the CEMP and this Specification. Material must be appropriately secured to ensure safe passage between destinations during transportation. Loads must have appropriate cover to prevent spillage from the vehicles. The Contractor will be held responsible for any clean-up resulting from the failure to properly secure transported materials.

11.1.22. Borrow Pits and Quarries

The Contractor shall make use of commercial suppliers for all rock and sand raw materials.

The Contractor shall ensure that any supplier is in possession of the required permit/license and keep record of the quantity of material supplied.

The Contractor will not make direct use of any borrow pits and quarries unless he has obtained written approval from the Engineer and Method Statement has been submitted.

The abovementioned Method Statement will provide the detailed description of the location of the borrow pits and/or quarries and the procedures that will be followed to adhere to any pertinent national or local legislation (e.g. mineral extraction, safety and noise levels).

11.1.23. Social and Labour Issues

The criteria for and selection of labourers, sub-contractors and suppliers for the project shall demonstrate preference for the local community and shall be aligned with the criteria set by Vaal Central Water in appointing the Contractor. The Contractor shall keep records of the identity of all staff.

Under no circumstances shall the Contractors engage in formal discussions with landowners without prior consent by the Engineer.

No activity on private property shall be allowed without written consent by the relevant landowner.

Any damage to private property caused by the Contractor during the construction period shall be repaired to the satisfaction of the Engineer.

The Contractor shall keep record of any complaint raised during the construction period relating to the Contractor`s activities.

No jobseekers shall be allowed on site.

11.1.24. Energy Management

The Contractor shall measure and keep updated records of the following:

- Electricity consumption (to be measured in Watt Hours)
- Fuel consumption (to be measured in litres)

11.1.25. Handling, Storage and Management of Hazardous Substances

All hazardous materials/substances shall be stored in a second, designated area that is fenced and has restricted entry.

All storage shall take place using suitable containers to the approval of the Engineer.

All hazardous liquids shall be located in a secure, demarcated area and an adequate bund wall (110% of the total volume stored) shall be provided. The floor and wall of the bund area shall be impervious to prevent infiltration of any spilled/leaked liquids into the soil.

No possible spillages or accumulated stormwater within this bunded area will be allowed to be flushed from the bund into the surrounding area. All fluids accumulated within the bunded area shall be removed and disposed of in accordance with Section 3.3.

Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure.

Weigh bills of hazardous substances shall be sources from suppliers and kept on site for inspection by the Environmental Control Officer.

The Contractor must provide a method statement detailing the hazardous substances that are to be used during construction, as well as the storage, handling and disposal procedures for each substance. Emergency procedures in the event of misuse or spillage that might negatively affect the environment must be specified.

(3) ANNEXURE A1: DECLARATION OF UNDERSTANDING – VAAL CENTRAL WATER

DECLARATION OF UNDERSTANDING

I, _____

representing_____

declare that I have read and understood the contents of the Environmental Management Programme for

Contract:_____

I also declare that I am able and shall comply with all legislation pertaining to the nature of work to be done and all things incidental thereto.

I further declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

_____

Signed:

_____

Place:

_____

Date:

_____

Witness 1:

_____

Witness 2:

ANNEXURE A2: DECLARATION OF UNDERSTANDING - CONTRACTOR

DECLARATION OF UNDERSTANDING

I, _____

representing_____

declare that I have read and understood the contents of the Environmental Management Programme for

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

_____

Signed:

_____

Place:

_____

Date:

_____

Witness 1:

_____

Witness 2:

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE A: GENERAL SITE WORKS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
A.1	**SANS 1200A 8,3**	**FIXED CHARGED ITEMS**				
A.1.1	8.3.1	Contractual requirements	sum	1		
	8.3.2	ESTABLISH FACILITIES ON THE SITE				
	8.3.2.1	FACILITIES FOR THE ENGINEER				
A.1.2	PSAB 3.1	Name board	no	1		
A.1.3	PSAB 3.2	Engineer's office and facilities	sum	1		
A.1.4	PSAB 4.1	Telephone/cellphone	prov sum	1	R 8 000,00	R 8 000,00
A.1.5		Contractor's mark up on Item A.1.4	%	8 000,00		
	8.3.2.2	FACILITIES FOR CONTRACTOR				
A.1.6		Office and storage sheds	sum	1		
A.1.7		Workshops	sum	1		
A.1.8		Laboratories	sum	1		
A.1.9		Living accommodation	sum	1		
A.1.10		Ablution and toilet facilities	sum	1		
A.1.11		Tools and equipment	sum	1		
A.1.12		Water supply, electic power and communications	sum	1		
A.1.13		Dealing with water (sub clause PSA 5.5)	sum	1		
A.1.14		Access	sum	1		
A.1.15		Other fixed charged obligations(specify) _____ _____	sum	1		
A.1.16		Remove engineer's and contractor's site establishment on completion of contract	sum	1		
A.2	**8,4**	**TIME RELATED ITEMS**				
A.2.1	8.4.1	Contractual requirements	sum	1		
	8.4.2	OPERATION AND MAINTENANCE OF FACILITIES ON SITE FOR DURATION OF CONSTRUCTION				
	8.4.2.1	FACILITIES FOR ENGINEER				
A.2.2	PSAB 3.1	Name board	sum	1		
A.2.3	PSAB 3.2	Engineer's office and facilities	sum	1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE A: GENERAL SITE WORKS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
A.2.4	PSAB 4.1	Telephone	prov sum	1	R 8 000,00	
A.2.5		Contractor's mark up on Item A.2.4	%	8 000,00		
	8.4.2.2	FACILITIES FOR CONTRACTOR FOR THE DURATION OF CONSTRUCTION				
A.2.6		Offices and storage sheds	sum	1		
A.2.7		Workshops	sum	1		
A.2.8		Laboratories	sum	1		
A.2.9		Living accommodation	sum	1		
A.2.10		Ablution and toilet facilities	sum	1		
A.2.11		Tools and equipment	sum	1		
A.2.12		Water supply, electric power and communications	sum	1		
A.2.13		Dealing with water (sub clause 5.5)	sum	1		
A.2.14		Access	sum	1		
A.2.15	8.4.5	Other time related obligations (specify)	sum	1		
A.3	**8,5**	**PROVISIONAL ITEMS**				
A.3.1		Community liaison officer	prov sum	1		
A.3.2		Contractor's mark up on Item A.3.1	%	0,00		
A.4	**PSA 8.4.6**	**STANDING TIME COSTS**				
A.4.1	a	Labour (Rate only)	sum/day			
A.4.2	b	Other resources (Rate only)	sum/day			
A.4.3	PSA 8.7	Daywork (provisional)	prov sum	1	R 50 000,00	R 50 000,00
A.5	**8,6**	**SUMS STATED PROVISIONALLY BY ENGINEER**				
A.5.1	a	Additional tests required by the Engineer	prov sum	1	R 50 000,00	R 50 000,00
A.5.2	b	Overheads, profit and charges on A.5.1 above	%	50 000,00		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE A: GENERAL SITE WORKS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
A.6	**PSA 8.9**	**OCCUPATIONAL HEALTH AND SAFETY MEASURES**				
A.6.1	PSA 8.9.1	Cost of health and safety measures required in terms of the Construction Regulations (2003) of the Occupational Health and Safety act	sum	1		
A.6.2	PSA 8.9.2	Including Risk Assessments, Safe Work Procedures and Method Statements	sum	1		
A.6.3	PSA 8.9.3	Compilation and maintenance of a Health and Safety File	sum	1		
A.7	**PSA 8.10**	**ENVIRONMENTAL MANAGEMENT PLAN**				
A.7.1	PSA 8.10.1	Providing a Method Statement on compliance with client's Environmental Management Plan Specification	sum	1		
A.7.2	PSA 8.10.2	Complying with requirements of the Environmental Management Plan	sum	1		
		TOTAL FOR SCHEDULE A (CARRIED FORWARD TO SUMMARY)				**R -**

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE B: GENERAL SITE WORKS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
B.1	**SANS 1200C**	**SITE CLEARANCE**				
B.1.1	8.2.1	Clear and grub small trees and bushes	m²	400		
	8.2.2	REMOVE AND GRUB LARGE TREES AND TREE STUMPS OF GIRTH				
B.1.2	(a)	Over 1 m and up to 2 m	no	1		
B.1.3	(b)	Over 2 m and up to 3 m	no	1		
B.1.4	8.2.4	Reclear surfaces (provisional) (where ordered by the Engineer)	m²	100		
	SANS 1200D	**EARTHWORKS**				
B.2	**8.3.2**	**EXCAVATION**				
B.2.1	8.3.1.2	Remove topsoil to nominal depth of 100 mm, stockpile and maintain	m²	200		
		BULK EARTHWORKS				
	8.3.2(a)	EXCAVATE IN ALL MATERIALS AND USE FOR EMBANKMENT, TERRACE CONSTRUCTION, BACKFIL OR DISPOSE WITHIN 1.5 km				
B.2.2		Cut to fill for forming terraces compacted to 93% MOD AASHTO density	m³	50		
B.2.3		Cut to stockpile for forming terraces (only when ordered	m³	50		
B.2.4		Stockpile to fill for forming terraces (only when ordered) compacted to 93% MOD AASHTO density	m³	50		
B.2.5		Cut to spoil	m³	50		
	8.3.3(b)	EXTRA OVER ITEMS B.2.2 to B.2.5 FOR EXCAVATIONS IN:				
B.2.6		Hard rock material	m³	50		
B.2.7	8.3.6	Overhaul (provisional)	m³km	500		
B.3	**SANS 1200MJ**	**SEGMENTED CONCRETE BLOCK PAVING AROUND STRUCTURES ON TERRACES**				
B.3.1	8,1	Preparation of area to be paved	m²	200		
B.3.2	8.2.2	Construction of paving with 60 mm thick concrete blocks (natural colour) including sandbed complete	m²	200		
B.3.3	8.2.1	Extra over item B.3.2 for provision and installation of edge restraints consisting of kerbing as per SANS 927 Fig. 6	m	200		
	8.2.3	CUTTING UNITS TO FIT EDGE RESTRAINTS				
B.3.4		Straight	m	200		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE B: GENERAL SITE WORKS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
B.3.5		Circular	m	50		
B.4		**ROAD CONSTRUCTION**				
	SANS 1200DM	**EARTHWORKS**				
B.4.1	8.3.2(a)	Remove topsoil 150 mm deep to stockpile and maintain	m³	30		
B.4.2	8.3.7	Excavate in all materials and spoil	m³	20		
		CUT TO FILL				
B.4.3	8.3.4	Compact to 90% Mod. AASHTO maximum density	m³	30		
		TREATMENT OF ROAD-BED				
B.4.4	8.3.3(a)	Road-bed preparation (150 mm thick) and compaction of material to 93% Mod. AASHTO maximum density	m³	90		
	8.3.13	SURFACE FINISHES				
B.4.5		Topsoiling and grading shoulders	m²	200		
	1200ME	SUBBASE (95% Mod. AASHTO MAXIMUM DENSITY)				
		CONSTRUCT GRAVEL BASE WITH MATERIAL FROM DESIGNATED EXCAVATIONS:				
B.4.6	8.3.1	Construct base with material from borrow pits or stockpiles within the freehaul distance	m³	30		
B.4.7	8.3.1	Construct subbase with material from obtained from commercial sources	m³	60		
B.4.8	8.3.5	Process material by means of stabilising	m³	90		
B.4.9	8.3.8	Stabilising agent : Portland blast furnace cement (3% by mass)	t	3		
		OVERHAUL				
B.4.10	8.3.9	Extra over item B.4.7 for hauling material in excess of the freehaul distance	m³.km	500		
	SABS 1200MJ	SEGMENTED CONCRETE BLOCK PAVING ON ROADS				
B.4.11	8,1	Preparation of area to be paved	m²	400		
B.4.12	8.2.2	Construction of paving with 80 mm thick concrete blocks (natural colour) including sandbed complete	m²	400		
B.4.13	8.2.1	Extra over item B.3.2 for provision and installation of edge restraints consisting of kerbing as per SANS 927 Fig. 6	m	250		
	8.2.3	CUTTING UNITS TO FIT EDGE RESTRAINTS				
B.4.14		Straight	m	200		
B.4.15		Circular	m	50		
TOTAL FOR SCHEDULE B (CARRIED FORWARD TO SUMMARY)						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE C: CHEMICAL DOSING BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	PART SPEC PB 8.2.1					
C.1	8.2.5	TILING				
C.1.1	(a)	500mm x 500mm heavy duty non slip floor tiles	m²	45		
C.1.2	(b)	150mm x 150mm heavy duty non slip wall tiles	m²	15		
C.2	8.2.9	WATERPROOFING OF CONCRETE ROOFS				
C.2.1		Waterproofing of concrete roofs with approved synthetic rubber or plastic sheet covering capable of being fusion welded, resistant to ultra-violet rays and heat, of thickness of not less than 2mm, complete with flashing around edges and covered with approved reflective paint.	m²	26		
C.3	8.2.20	PAINTING				
C.3.1		Varnishing door D1 and frame with Woodoc 50 or approved water repellent wood sealer. Rate includes preparation of surface.	no	1		
C.3.2		Window W1 with approved enamel paint	no	3		
		CHEMICAL TANKS SHELTER REFER TO DRG. U029-S04-0 & U029-S05-0				
C.4	**SANS 1200D**	**EARTHWORKS**				
	8.3.3	RESTRICTED EXCAVATION				
	8.3.3(a)	EXCAVATE FOR FOUNDATIONS AND CABLE TRENCHES IN ALL MATERAILS, BACKFILL BEHIND STRUCTURES, CONSTRUCT EMBANKMENTS OR DISPOSE WITHIN THE FREEHAUL DISTANCE FOR DEPTHS:				
C.4.1		0 m up to 2 m	m³	14		
		FOUNDATION FILL COMPACTED TO 95% MOD AASHTO IN LAYERS NOT EXCEEDING 150 mm IN THICKNESS, CONSISTING OF:				
C.4.2		Compacted hardcore filling	m³	8,5		
	8.3.3 (b)	EXTRA OVER ITEM E.1.1 FOR EXCAVATION IN:				
C.4.3		Hard rock material	m³	3,5		
		CARRIED FORWARD				

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
C.5	**SANS 1200G**	**CONCRETE (STRUCTURAL)**				
	8,2	**FORMWORK**				
	8.2.2	SMOOTH FORMWORK (MEASURED TO 150mm below FINISHED GROUND LEVEL WHERE APPLICABLE)				
		PLANE VERTICAL				
		Trimming/preparing vertical sides of excavation to cast concrete strip footings in soft or intermediate material				
C.5.1		Sides of footings of shelter structure foundations	m^2	5,8		
C.5.2		Sides of footings (where not cast against face of excavation)	m^2	2,9		
C.5.3		External faces of stub columns	m^2	12,3		
C.6	**8,3**	**REINFORCEMENT**				
C.6.1		High-tensile steel bars	t	0,5		
C.6.2		Mild steel bars	t	0,2		
C.7	**8,4**	**CONCRETE**				
C.7.1	8.4.2	BLINDING LAYER IN GRADE 15/10 CONCRETE 50 mm THICKNESS	m^2	6		
	8.4.3	STRENGTH CONCRETE 25/19				
C.7.2		Column Footings	m^3	2,1		
C.7.3		Stub Columns	m^3	1,65		
C.8	**SANS 1200H 8.3.1**	**SUPPLY OF STRUCTURAL STEEL**				
		Unless other specified, structural steelwork complies with EN10025-2 Grade S355 JR. Circular Hollow Sections used for bracing will be cold formed from grade 300W steel to SANS 657-1, in accordance with the specification and tender drawings complete with all necessary cleats, brackets, gussets stiffeners, cap and base plates, packs and the like.				
C.8.1		Preparation of shop detail drawings	Sum	1		
C.8.2		Universal columns (lighter than 60kg/m) incl end plates	t	0,72		
C.8.3		Universal beams (lighter that 50kg/m) incl. end plates	t	1,08		
CARRIED FORWARD						

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
C.8.4		Cold rolled lipped channel - purlins and girts with yield stress 225MPa	t	0,47		
C.8.5		50x50x5mm sag bars	t	0,01		
C.8.6		365x290x16mm Galvanised Base Plate as per detail	No	4		
C.8.7		Purlins-Black Bolts Grade 8.8 including flat and /or tapered washers - HD Galvanized (as shown on drawing)	Sum	1		
C.8.8	8.3.4	Base-Black Bolts Grade 8.8 including flat and /or tapered washers - HD Galvanized (as shown on drawing)	No	16		
C.8.9	8.3.13	m) Hot deep Galvanizing As Per Engineer's Specification	t	2,5		
	8.3.2	**Delivery**				
		Load at Works, delivery to site, offload, transport and stack	t	2,5		
C.8.10		**Erection**				
		Erection, including taking from stacking area, transporting to site, erecting and touching up primer coat where damaged and painting, one under coat and one finish coat as per specification, after erection	t	2,5		
C.9	**SANS 1200HB**	**ROOF COVERINGS,ETC**				
	8.2.2	**RIBBED METAL SHEETING AND ACCESSORIES**				
		"0.5mm "IBR roof sheeting and accessories fixed to steel purlins at 1200mm centres, all in accordance with manufacturer's recommendations.				
C.9.1		Roof covering with pitch not exceeding 5 degrees, in transprtable lengths not exceeding 10m.	m^2	65		
C.9.2		Badged flashings curved on each side.	7,80	95		
		RAINWATER GOODS ETC.				
		Gutters				
C.9.3		220 x 200 seamless box gutter fixed to steel section	m	8		
C.9.4		110mm x110mm aluminium down pipes	m	3		
		TOTAL FOR SCHEDULE C (CARRIED FORWARD TO SUMMARY)				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE D: RAPID GRAVITY SAND FILTERS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
D.1	**SANS 1200D**	**EARTHWORKS**				
	8.3.3	RESTRICTED EXCAVATION				
	8.3.3(a)	EXCAVATE FOR FOUNDATIONS AND PIPE TRENCHES IN ALL MATERAILS, BACKFILL BEHIND STRUCTURES, CONSTRUCT EMBANKMENTS OR DISPOSE WITHIN THE FREEHAUL DISTANCE FOR DEPTHS:				
D.1.1		0 m up to 2 m	m³	26		
D.1.2		Exceeding 2m up to 4m	m³	18		
D.1.3	8.3.3(b)	Extra over items D.1.1 to D.1.2 for excavation in hard rock material	m³	10		
D.1.4	PSD 8.3.3 (c)	Extra over itemes D.1.1 to D.1.3 for 5% soil cement backfilling where instructed by the engineer	m³	10		
D.1.5	PSD 8.3.3 (d)	Excavate and dispose of unsuitable material from bottom of excavations	m³	25		
D.2	**1200L**	**PIPE SPECIALS**				
D.2.1	8.2.5	Supply, installation and testing of pipes, fittings and specials as detailed in the pipe schedule	sum	1		
D.3	**SANS 1200G**	**CONCRETE (STRUCTURAL)**				
	8,2	FORMWORK				
	8.2.1	ROUGH WORK				
		PLANE VERTICAL				
D.3.1		Sides of floor slabs not to be trimmed	m²	5		
	8.2.2	SMOOTH FORMWORK (MEASURED TO 150mm BELOW FINISHED GROUND LEVEL WHERE APPLICABLE)				
		PLANE VERTICAL				
D.3.2		Sides of floor slabs	m²	12		
		CARRIED FORWARD				

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
D.3.3		Internal face of roof parapet walls	m²	9		
D.3.4		External faces of walls below ground level	m²	80		
D.3.5		Sides of mass concrete where ordered by the Engineer	m²	5		
	8.2.2	SPECIAL SMOOTH REPAIRED AND RUBBED FORMWORK (MEASURED FROM 150 mm BELOW FINISHED GROUND LEVEL WHERE APPLICABLE) PLANE HORIZONTAL				
D.3.6		Soffits of filter outlet channels and boxes	m²	28		
D.3.7		Soffit of roof slabs	m²	60		
D.3.8		Soffit of walkways and floor slabs	m²	45		
		PLANE SLOPING				
D.3.9		Soffit of staircases	m²	4		
		PLANE VERTICAL				
D.3.10		External faces of filter walls	m²	150		
D.3.11		Internal faces of filter walls	m²	200		
D.3.12		Sides of walkways	m²	20		
D.3.13		Sides of risers of stairs	m²	5		
D.3.14		Sides of beams	m²	2		
D.3.15		Sides of columns	m²	4		
D.3.16		External sides of roof slabs and parapet walls	m²	30		
D.3.17		Sides of overflow channel	m²	185		
D.3.18		Sides of upstand on walkways and stairs (100mm high)	m²	10		
		SPECIAL FORMWORK				
	8.2.6	BOX OUT HOLES / FORM VOIDS				
D.3.19	(a)	Small, circular of diameter up to 0.35m, up to 0.5m deep	no	16		
D.3.20	(b)	Small, other than circular of area up to and including 0.1m² up to 0.5m deep	no	2		
D.3.21	(c)	Large, other than circular of area over 0.1m² up to and including 0.5m², up to 0.5m deep	no	8		
D.3.22	(d)	Large, other than circular of area over 0.5m² up to and including 1m², up to 0.5m deep	no	22		
		CARRIED FORWARD				

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
D.4	**8,3**	**REINFORCEMENT**				
		HIGH TENSILE STEEL BARS				
D.4.1	8.3.1	Y25 mm dia. : basic price	t	15		
		EXTRA OVER ITEM D.4.1 (PROVISIONAL QUANTITIES) FOR BARS OF DIAMETER				
D.4.2		Y10 m	t	2,5		
D.4.3		Y12 mm	t	10		
D.4.4		Y16 mm	t	3		
D.4.5		Y20 mm	t	3		
		MILD STEEL BARS				
D.4.6	8.3.1	R25 mm dia. : basic price	t	2		
		EXTRA OVER ITEM D.4.6 (PROVISIONAL QUANTITIES) FOR BARS OF DIAMETER				
D.4.7		R8 mm	t	0,5		
D.4.8		R10 mm	t	1		
D.4.9		R12 mm	t	0,5		
D.4.10		Apply 30 microns of waterborne rust converter (Polycell End Rust by Plascon or similar approved) to exposed rebar	ℓ	100		
D.5	**8,4**	**CONCRETE**				
	8.4.2	BLINDING LAYER IN GRADE 20/20 CONCRETE 50 mm THICKNESS				
D.5.1		Horizontal	m²	110		
		STRENGTH CONCRETE GRADE 20/20 IN FILLING OF OVER-BREAK IN EXCAVATIONS IN ROCK TO FORM BLINDING LAYER				
D.5.2		Horizontal	m²	110		
		STRENGTH CONCRETE 20/20				
D.5.4		Mass concrete below structures or where ordered	m³	5		
		STRENGTH CONCRETE 20/10				
D.5.5		Benching to channels	m³	9		
D.5.6		Screeds to floors and roofs	m³	6		
		STRENGTH CONCRETE 35/20				
D.5.7		Floor slabs	m³	35		
		CARRIED FORWARD				

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
D.5.8		Straight walls	m³	100		
D.5.9		Walkways	m³	10		
D.5.10		Roof slabs	m³	16		
D.5.11		Walls of overflow channel	m³	8		
D.5.12		Parapet walls	m³	2		
D.5.13		Stair cases	m³	3		
D.5.14		Columns	m³	5		
D.5.15		Filter false floor (under supervision of mechanical contractor)	m³	6		
	8.4.4	UNFORMED SURFACE FINISHES				
D.5.16		To upper surfaces of concealed work and surfaces to receive benching or screed	m²	15		
		WOOD FLOAT FINISH				
D.5.17		To upper surfaces of screed on roof slabs	m²	70		
D.5.18		Top of walls and parapet walls	m²	8		
D.5.19		Top of walkways, false floors and channel floors	m²	35		
D.5.20		Tread of stairs	m²	4		
D.5.21		Filter false floor	m²	26		
		STEEL FLOAT FINISH				
		UPPER SURFACES OF:				
D.5.22		Benching in channels	m²	85		
D.5.24		Backwash and weirs	m²	7		
D.6	**8,7**	**GROUTING IN OF EQUIPMENT SUPPLIED AND INSTALLED BY PLANT SUPPLIER WITH**				
D.6.1		Non-shrink grout ("Degussa Masterflow 524" or similar approved)	m³	0,25		
	PSG 8.9	TESTING STRUCTURES FOR WATERTIGHTNESS				
D.6.2		Filters (including outlet channels)	no	3		
	PSG 8.10	BUILDING PIPES INTO CONCRETE WORK AND GROUTING PIPES INSTALLED BY THE MECHANICAL CONTRACTOR				
		PIPES SUPPLIED AND INSTALLED BY THE CIVIL CONTRACTOR OF DIAMETER AND OPENING SIZES (IRRESPECTIVE OF TYPE)				
D.6.3		Up to and including 200mm diameter, openings up to 400mm square	no	1		
		CARRIED FORWARD				

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
D.6.4		Over 200mm up to and including 300mm diameter, openings up to 500mm square	no	1		
D.6.5		Over 300mm up to and inlcuding 400mm diameter, openings up to 600mm square	no	1		
D.6.6		Over 400mm up to and including 500mm diameter, openings up to 700mm square	no	2		
D.6.7		Over 500mm up to and including 600mm diameter, openings up to 900mm square	no	1		
		PIPES SUPPLIED AND INSTALLED BY MECHANICAL CONTRACTOR OF DIAMETER AND OPENING SIZES (IRRESPECTIVE OF TYPE)				
D.6.8		Up to and including 200mm diameter, openings up to 400mm square	no	2		
D.6.9		Over 200mm up to and including 300mm diameter, openings up to 500mm square	no	16		
D.6.10		Over 800mm up to and including 900mm diameter, openings up to 1100mm square	no	3		
		BUILDING PIPES INTO BRICKWORK				
D.6.11		160mm PVC pipes into 230mm thick brick wall	no	2		
D.7	**SANS 1200 HA**	**STRUCTURAL STEELWORK (SMALL WORK)**				
D.7.1	8.3.2 (b)	Galvanised handrail assembly complete	m	65		
D.7.2	8.3.4 (a)	SS304 open grid steel flooring complete and installed with SS304 frames	m²	2		
D.8	**PART SPEC PB**	**BUILDING WORK**				
	8.2.1	BRICKWORK				
D.8.1		230mm thick, both faces face brick (allow a purchase price of R3000,00 per 1000 bricks, excl VAT)	m²	85		
D.8.2		Supply and install Kilcher Limitgliss bearing (40kN/m) between concrete roof and brickwork (220mm wide)	m	30		
		WATERPROOFING OF CONCRETE ROOFS				
D.8.3		Waterproofing of concrete roofs with approved synthetic rubber or plastic sheet covering capable of being fusion welded, resistant to ultra-violet rays and heat, of thickness of not less than 2mm, complete with flashing around edges and covered with approved reflective paint.	m²	5		
D.8.4	(a)	Brick on edge on external side of window including DPC as shown in the drawings.	m	15		
D.8.5	(b)	Quarry tile, 110mm wide, on internal side of window.	m	15		
	8.2.5	TILING				
D.8.6		150mm x 150mm white glazed tiles to walls and floors of clear-water filter outlet channels.	m²	15		
	8.2.14	RAINWATER OUTLETS				
D.8.7		Supply and installation of 80mm diameter "Eze-flo" or similar approved cast iron rainwater outlet in roof slab	no	2		
D.8.8		80mm diameter medium quality galvanised screwed and socketed pipes including galvanised holding brackets	m	10		
D.8.9		80mm diameter medium qulaity galvanized 45 degree bends	no	2		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE D: RAPID GRAVITY SAND FILTERS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
	8.2.17	JOINERY				
D.8.10	(a)	Supply and install door D1 (800mm wide x 2100mm high) complete with frame	no	3		
D.8.11	(a)	Supply and install door D2 (1500mm wide x 2400mm high) complete with frame	no	1		
	8.2.18	METAL WORK				
D.8.12		Supply and install standard industrial type window SS23, 673mm wide x 1445mm high, complete as specified (window W1)	no	2		
D.8.13		Supply and install standard industrial type window SS43, 1300mm wide x 1445mm high, complete as specified (window W2)	no	6		
	8.2.20	PAINTING				
D.8.14		Door D1 and frame with Woodoc 50 or approved water repellent wood sealer	no	3		
D.8.15		Door D2 and frame with Woodoc 50 or approved water repellent wood sealer	no	1		
D.8.18		window W1 with Plascon Velvaglo (or similar approved) paint, colour olive branch D22-6	no	2		
D.8.19		window W2 with Plascon Velvaglo (or similar approved) paint, colour olive branch D22-6	no	6		
D.9		**SUNDRY ITEMS**				
	SANS 1200LD 8.2.4	**MANHOLE COVERS**				
D.9.1		Supply and install 760 mm square manhole cover and frame complete, including forming of opening in 250mm thick concrete slab as specified on DWG 230410PR0/05/02	no	1		
		VOID FORMERS				
D.9.2		Polystyrene void formers	m^3	3		
		CORING OF OPENINGS IN CONCRETE MEMBERS				
D.9.3		Coring of 65mm diameter openings in 250mm thick reinforced concrete floors	no	12		
D.9.4		Coring of 100mm diameter openings in 250mm thick reinforced concrete floors	no	1		
TOTAL FOR SCHEDULE D (CARRIED FORWARD TO SUMMARY)						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE E: CHLORINATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
E.1	**SANS 1200D**	**EARTHWORKS**				
	8.3.3	RESTRICTED EXCAVATION				
	8.3.3(a)	EXCAVATE FOR FOUNDATIONS AND CABLE TRENCHES IN ALL MATERAILS, BACKFILL BEHIND STRUCTURES, CONSTRUCT EMBANKMENTS OR DISPOSE WITHIN THE FREEHAUL DISTANCE FOR DEPTHS:				
E.1.1		0 m up to 2 m	m³	13		
		FOUNDATION FILL COMPACTED TO 95% MOD AASHTO IN LAYERS NOT EXCEEDING 150 mm IN THICKNESS, CONSISTING OF:				
E.1.2		Compacted hardcore filling	m³	13		
	8.3.3 (b)	EXTRA OVER ITEM E.1.1 FOR EXCAVATION IN:				
E.1.3		Hard rock material	m³	6		
	PART SPEC PB	**WATERPROOFING**				
E.1.4	8.2.9 (a)	250 micron plastic sheeting underneath floorslabs	m²	19		
E.2	**SANS 1200G**	**CONCRETE (STRUCTURAL)**				
	8.2.1	ROUGH FORMWORK				
		PLANE VERTICAL				
E.2.1		Trimming/preparing vertical sides of excavation to cast concrete against it in soft and intermediate material	m²	5		
	8,2	FORMWORK				
	8.2.2	SMOOTH FORMWORK (MEASURED FROM 150 mm BELOW FINISHED GROUND LEVEL WHERE APPLICABLE)				
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE E: CHLORINATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
		PLANE HORIZONTAL				
E.2.2		Soffit of roof slab (including overhang)	m²	26		
		PLANE VERTICAL				
E.2.3		Sides of footings (where not cast against face of excavation)	m²	5		
	8.2.3	SPECIAL SMOOTH, REPAIRED AND RUBBED FORMWORK (MEASURED FROM 150mm BELOW FINISHED GROUND LEVEL)				
		PLANE VERTICAL				
E.2.4		Sides of roof slabs (150 mm high)	m²	6		
		SPECIAL FORMWORK				
	8.2.6	BOX OUT HOLES / FORM VOIDS				
E.2.5		Forming drip groove tapering from 38 to 30mm, 20mm deep below roof slab	m	20		
E.2.6		Leave 150 mm wide x 160 mm high openings in 220 mm brickwork and building in of pipes up to 100 mm diameter	no	6		
E.3	**8,3**	**REINFORCEMENT**				
		HIGH TENSILE STEEL BARS				
E.3.1	8.3.1	Y25 mm dia. : basic price	t	0,8		
		EXTRA OVER ITEM E.3.1 (PROVISIONAL QUANTITIES) FOR BARS OF DIAMETER				
		FOR BARS OF DIAMETER				
E.3.2		Y10 mm	t	0,6		
E.3.3		Y12 mm	t	0,1		
E.3.4		Y16 mm	t	0,1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE E: CHLORINATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
		MILD STEEL BARS				
E.3.5	8.3.1	R25 mm dia. : basic price	t	0,01		
		EXTRA OVER ITEM E.3.5 (PROVISIONAL QUANTITIES) FOR BARS OF DIAMETER				
E.3.6		R8 mm	t	0,004		
E.3.7		R10 mm	t	0,002		
E.3.8		R12 mm	t	0,002		
E.3.9		High-tensile welded mesh reference 245	m²	19		
E.4	**8,4**	**CONCRETE**				
		STRENGTH CONCRETE 20/20				
E.4.1		Footing to brick walls	m³	4		
E.4.2		Floor slab of chlorination building	m³	3		
		STRENGTH CONCRETE 35/20				
E.4.3		Roof slab	m³	6		
	8.4.4	UNFORMED SURFACE FINISHES				
E.4.4		To upper surfaces of concealed work and surfaces to receive benching or screed	m²	2		
		WOOD FLOAT FINISH				
E.4.5		To upper surfaces of floor slabs	m²	19		
E.5		**STEEL FLOAT FINISH**				
		UPPER SURFACES OF:				
E.4.6		Top of roof slab	m²	26		
E.6	**PART SPEC PB**	**BUILDING WORK**				
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE E: CHLORINATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
E.6	**PART SPEC PB**	**BUILDING WORK**				
	8.2.1	BRICKWORK				
E.6.1		220mm thick, both faces face brick	m²	54		
E.6.2		220 mm, one face stock brick, other face, face brick, for foundation walls, below ground level	m²	12		
E.6.3		220 mm, both faces face brick, for foundation walls above final ground level	m²	7		
E.6.4		Supply and install Kilcher Limitgliss bearing (30kN/m) between concrete roof and brickwork (220mm wide)	m	22		
E.6.5		Supply and install two layers 250 micron thick plastic sheeting, 220mm wide between floor slab and brick wall (DPC)	m	22		
		WATERPROOFING OF CONCRETE ROOFS				
E.6.7		Waterproofing of concrete roofs with approved synthetic rubber or plastic sheet covering capable of being fusion welded, resistant to ultra-violet rays and heat, of thickness of not less than 2mm, complete with flashing around edges and covered with approved reflective paint.	m²	27		
	8.2.4	WINDOW SILLS				
E.6.7	(b)	Quarry tile, 110mm wide, on both sides of window	m	3		
	8.2.17	JOINERY				
E.6.11	(a)	Supply and install door D1 (915 mm wide x 2100 mm high) complete with frame	no	1		
E.6.11	(a)	Supply and install door D2 (1 500 mm wide x 2 500mm high) complete with frame	no	1		
	8.2.18	METAL WORK				
E.6.12		Supply and install standard bronze anodized aluminium window (1 022 mm wide x 949 mm high)	no	1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE E: CHLORINATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
	8.2.20	PAINTING				
E.6.14		Varnishing door D1 with approved water repellent wood sealer and painting of framewith enamel paint	no	1		
E.6.15		Varnishing door D2 with approved water repellent wood sealer and painting of framewith enamel paint	no	1		
E.7		**MISCELLANEOUS**				
E.7.1		Leaving openings in brickwork for fans provided by mechanical supplier, including building in	no	2		
TOTAL FOR SCHEDULE E (CARRIED FORWARD TO SUMMARY)						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE F: ADMINISTRATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
F.1	**PS PB**	**TILING**				
F.1.1	8.2.5	Wall tiles (glazed ceramic) white	m²	54		
F.1.2	8.2.19 (a)	Vinyl floor tiles (2mm Marley Heavy Duty or equal approved)	m²	45		
F.1.3	8.2.5 (b)	Vinyl cove skirting	m	40		
F.1.4	8.2.5 (a)	300mm x 300mm heavy duty non slip floor tiles	m²	30		
F.1.5	8.2.5 (b)	100mm high heavy duty non slip tile skirting including cutting of tiles	m²	15		
F.2	**8.2.18**	**STEEL DOOR FRAMES INCLUDING LINTOL**				
F.2.1		D3 (1500 x 2000 x 220 wall)	no	1		
F.3	**PSPB**	**JOINERY**				
F.3.1		D3 (1500 x 2000 x 45) hardwood double door (outward opening)	no	1		
F.3	**PSPB**	**STRUCTURAL TIMBER**				
F.3.1	8.2.11 (f)	Brandering 38 x 38 SAP	m	130		
F.3.2	**8.2.12**	**Double roman through colour concrete roof tiles**	**m²**	**5**		
F.3.3		Ridge tiles edge bedded solid at joints	m	5		
F.4		**GUTTERS**				
F.4.1		80 x 55 colourbond aluminium downpipes	m	14		
F.5		**PLUMBING**				
F.5.1		Water closet suite (semi-close-coupled), fittings and connections to relevant pipework	no	1		
F.5.2		Hand wash basin complete, fittings, taps and connections to relevant pipework	no	1		
F.5.3		Shower tray (905mm x 905mm), fittings, taps and connections to relevant pipework	no	1		
F.5.4		Stainless steel double bowl, 1800 x 600 x 150, fittings, taps, cabinet and connections to relevant pipework	no	1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE F: ADMINISTRATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
F.5.5		Laboratory sink, fittings, taps, cabinet and connections to relevant pipework	no	1		
F.5.6		150 litre high pressure horizontal mounted geyser, complete with drip tray, pressure control valve, overflow and connections to relevant pipework	no	1		
F.5.7		Supply, install and connect 15 mm copper pipes including for all applicable fittings to complete cold and hot water reticulation and connection to main water supply line	sum	1		
F.5.8		Extra over item F.12.7 for supply and installation of 15 mm dia. brass stopcock	no	1		
F.5.9		Extra over item F.12.7 for supply and installation of Masterflow or equal approved pressure reducing valve (pressure rating 100 kPa)	no	1		
		SUPPLY, INSTALL AND CONNECT PVC WASTE PIPES INCLUDING FOR APPLICABLE FITTINGS				
F.5.10		(a) Hand wash basin 40 mm dia.	no	1		
F.5.11		(b) Sink 40 mm dia.	no	1		
F.5.12		(c) Laboratory sink 40 mm dia.	no	1		
F.5.13		(d) Shower 40 mm dia.	no	1		
F.5.14		Connect WC with PVC pipework and fittings to PVC reticulation,including 50 mm diameter two-way siphon valve	no	1		
F.5.15		Supply and install concrete gulley	no	4		
F.6	**PSPB**	**PAINTING**				
	8.2.20	PAINTING OF ADMINISTRATION BUILDING				
F.6.1		Ceilings (plascon double velvet)	sum	1		
F.6.2		Door and window frames (plascon enamel)	sum	1		
F.6.3		Wooden doors (woodoc 50)	sum	1		
F.6.4		Fascias, gutters and downpipes (plascon enamel)	sum	1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE F: ADMINISTRATION BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
F.7		**PROVISIONAL ITEMS**				
F.7.1		Supply and installation of office furniture	prov.	sum		
F.7.2		Supply and installation of laboratory furniture and water testing equipment	prov.	sum		
F.7.3		Add Contractor's charges onto the Provisional Sums	%	R0,00		
F.8		**MISCELLANEOUS**				
F.8.1		Hardwood bench, complete as detailed on the drawings	no	1		
F.8.2		Metal factory locker, two compartments	no	4		
F.8.3		Precast rainwater channels (1000 x 300 x 150 mm)	no	4		
F.8.4		Triple sliding white aluminium shower door with obscure translucent safety glass for 1000mm wide opening	no	1		
F.8.5		Supply and installation of 3000 litre calcamite septic tank, including connections to relevant pipework	no	1		
F.8.6		French drain complete	sum	1		
TOTAL FOR SCHEDULE F (CARRIED FORWARD TO SUMMARY)						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE G: INTERCONNECTING PIPEWORK AND MANHOLES

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
G.1	**SANS 1200DB**	**EARTHWORKS (PIPE TRENCHES)**				
	8.3.2	EXCAVATION				
	8.3.2(a)	EXCAVATE IN ALL MATERIALS FOR TRENCHES, BACKFILL AND COMPACT, INCLUDING DISPOSAL OF SURPLUS UNSUITABLE MATERIAL WITHIN THE FREEHAUL DISTANCE FOR PIPES, CABLE DUCTS AND PIPE SLEEVES WITH DIAMETER				
		UP TO 100 mm DIAMETER FOR DEPTHS				
		OVER AND UP TO:				
G.1.1		0,0m - 1,5m	m	200		
G.1.2		1,5m - 2,5m	m	40		
		OVER 100mm UP TO 315 mm DIAMETER FOR DEPTHS				
G.1.3		0,0m - 1,5m	m	550		
G.1.4		1,5m - 2,5m	m	175		
G.1.5		2,5m - 3,0m	m	2		
G.1.6	8.3.2(b)	Extra over Items G.1.1 to G.1.5 for excavation (provisional) in hard rock material	m³	350		
G.1.7	PSDB 8.3.2(d)	Excavate by hand in soft material to expose existing services	m³	5		
G.1.8	PSDB 8.3.2 (e)	Excavate and backfill by hand in restriced areas	m³	5		
G.1.9	8.2.4	Shoring of trenches where instructed by the engineer	m²	5		
	8.3.3.1	IMPORT BACKFILL MATERIALS FROM				
G.1.10	(a)	Other excavations on site	m³	300		
G.2	**1200L**	**PIPE SPECIALS**				
G.2.1	8.2.5	Supply, installation and testing of pipes and specials as detailed in the pipe schedule	sum	1		
G.3	**SANS 1200L**	**MEDIUM PRESSURE PIPELINES**				
	8.2.1	SUPPLY, HANDLE, LAY AND BED FOR FLEXIBLE PIPES				
		uPVC class 9				
G.3.1		90 mm diameter	m	150		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE G: INTERCONNECTING PIPEWORK AND MANHOLES

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
G.3.2		110 mm diameter	m	5		
G.3.3		160 mm diameter	m	5		
G.3.4		200 mm diameter	m	5		
G.3.5		250 mm diameter	m	350		
		uPVC Class 12				
G.3.6		315 mm diameter	m	10		
	8.2.2	SPECIALS AND FITTINGS				
		SUPPLY, LAY, JOINT, BED FOR FLEXIBLE PIPES AND TEST, INCLUDING CUTTING PIPES, SUPPLYING FLEXIBLE COUPLINGS AND STEEL BENDS WHERE APPLICABLE				
		EXTRA OVER ITEMS G.3.1 TO G.3.6 FOR PIPE LAYING				
		uPVC 90° BENDS				
G.3.7		90mm diameter	no	5		
G.3.8		110mm diameter	no	1		
G.3.9		160mm diameter	no	1		
G.3.10		200mm diameter	no	1		
G.3.11		250mm diameter	no	2		
G.3.12		315 mm diameter	no	1		
		uPVC 45° BENDS				
G.3.13		90mm diameter	no	2		
G.3.14		110mm diameter	no	1		
G.3.15		160mm diameter	no	1		
G.3.16		200mm diameter	no	1		
G.3.17		250 mm diameter	no	1		
G.3.18		315 mm diameter	no	1		
		uPVC 22,5° BENDS				
G.3.19		90mm diameter	no	2		
G.3.20		250mm diameter	no	2		
		SUB-TOTAL CARRIED FORWARD				

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
		SUPPLY, HANDLE, LAY AND BED CLASS B AND JOIN WITH PLASSON COUPLINGS				
		HDPE CLASS 10				
G.3.21		25mm diameter	m	30		
G.3.22		32mm diameter	m	30		
G.3.23		50mm diameter	m	30		
		TAPS WITH HOSE CONNECTIONS				
G.3.24		Standpipes with 25mm tap and hose connection projecting 900mm above ground level complete with 25mm diameter GMS connecting pipe, adaptors, supports (Y-section standard)	no	5		
		EXTRA OVER ITEMS G.3.21 TO G.3.23				
		HDPE COMPRESSION ELBOWS				
G.3.25		25mm diameter	no	2		
G.3.26		32mm diameter	no	2		
G.3.27		45mm diameter	no	2		
		HDPE COMPRESSION MALE ADAPTORS				
G.3.28		25mm diameter	no	2		
G.3.29		32mm diameter	no	2		
G.3.30		50mm diameter	no	2		
		HDPE COMPRESSION 90° EQUAL TEES				
G.3.31		25mm diameter	no	2		
G.3.32		32mm diameter	no	2		
G.3.33		50mm diameter	no	2		
		HDPE COMPRESSION REDUCING COUPLINGS				
G.3.34		32 x 25mm	no	2		
G.3.35		50 x 32mm	no	2		
G.3.36	PSL 8.2.11	Anchor or thrust blocks	m^3	3		
G.3.37	8.2.11	Encase pipes in concrete Grade 20/20	m^3	3		
		SUB-TOTAL CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE G: INTERCONNECTING PIPEWORK AND MANHOLES

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
G.4	**SANS 1200LB**	**BEDDING (PIPES)**				
	8.2.1	FROM TRENCH EXCAVATION				
G.4.1	(a)	Selected granular material for bedding cradle	m³	70		
G.4.2	(b)	Selected fill material	m³	300		
		SUPPLY ONLY OF BEDDING MATERIAL BY IMPORTING FROM BORROW PITS WITHIN THE FREEHAUL DISTANCE				
G.4.3	(a)	Selected granular material for bedding cradle	m³	300		
	8.2.5	OVERHAUL OF MATERIAL FOR BEDDING				
G.4.4		Overhaul	m³.km	200		
G.5	**SANS 1200LC**	**CABLE DUCTS**				
	8.2.5	SUPPLY, LAY, BED AND PROVE DUCT				
G.5.1		110 mm uPVC class 34	m	20		
G.5.2		160 mm uPVC class 34	m	20		
G.5.3	8.2.7	Construct brick draw pits 1500 x 1500 x 1500mm deep complete with base and cover slabs including class 4 manhole cover and frame	no	2		
G.6	**SANS 1200LD**	**SEWERS**				
	8.2.1	SUPPLY, LAY, JOINT, BED CLASS B AND TEST uPVC CLASS 34 PIPES WITH INCLUDING CUTTING OF PIPES				
G.6.1		110 mm diameter	m	30		
G.6.2		315 mm diameter	m	175		
	8.2.3	MANHOLES				
		MANHOLES 1000mm DIAMETER COMPLETE WITH TYPE 4 COVER AND FRAME FOR DEPTHS:				
G.6.3		Up to 1,5m	no	6		
G.6.4		1,5m up to 2,5m	no	2		
		TOTAL FOR SCHEDULE G (CARRIED FORWARD TO SUMMARY)				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
H.1	**SANS 1200DE**	**EARTHWORKS (Small Earth Dams)**				
	8.3.1.6	SITE CLEARANCE				
H.1.1	8.3.2	Topsoil to nominal depth of 100 mm, stockpile and maintain	ha	0,6		
	8.3.3	EXCAVATION				
H.1.2	8.3.3(a)	Material unsuitable for embankment (cut to spoil to designated spoil site)	m³	1 000		
H.1.3	8.3.3(b)	Material suitable for embankment (cut to stockpile)	m³	500		
	8.3.3(c)	EXTRA OVER ITEM G.1.2 AND G.1.3 FOR EXCAVATION IN:				
H.1.4		Hard rock material	m³	100		
	8.3.4	PREPARATION OF EXPOSED SURFACES FOR AREA TO BE COVERED BY POND EMBANKMENT AND AREA TO BE COVERED BY BENTONITE MIXED WITH SOIL LAYER				
H.1.5		Scarify 150 mm deep and compact to 93% mod. AASHTO density (horizontal)	m²	3 400		
H.1.6		As in item G.1.5 but sloping 1:2	m²	1 600		
H.1.7		As in item G.1.5 but sloping 1:6	m²	1000		
	8.3.5	FORMING EMBANKMENT WITH SUITABLE MATERIAL COMPACTED TO 93% MOD AASHTO				
H.1.8		From pond excavations (i.e. from stockpile) or other excavations on site	m³	500		
		IMPORT MATERIAL, PLACE AND COMPACT EMBANKMENT TO 93% MOD AASHTO DENSITY				
H.1.9		From existing borrow pits and excavations on site	m³	1000		
H.1.10		From commercial sources	m³	250		
	8.3.5	Construct layer not exceeding 150 mm consisting of 10 to 12 kg/m² Bentonite mixed thoroughly with dry suitable soil imported from borrow pit within 2,0 km or excavations elswhere on site. Thereafter raise moisture content to between OMC and 2% wet of OMC and compact to 93% MOD AASHTO				
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
H.1.11		150 mm layer (horizontal)	m²	3 400		
H.1.12		150 mm layer (sloping 1:2)	m²	1 600		
H.1.13		150 mm layer (sloping 1:10)	m²	1000		
	8.3.5	Construct horizontal cover layer not exceeding 150 mm consisting of selected granular material compacted to 93% MOD AASHTO				
H.1.14		From pond excavations or other excavations on site	m²	100		
H.1.15		From existing borrow pits and excavations on site	m²	3 000		
H.1.16		From commercial sources	m²	200		
	8.3.8	OVERHAUL				
H.1.17		Overhaul in excess of 3 km (provisional)	m³/km	1 000		
H.2	**1200L**	**PIPE SPECIALS**				
H.2.1	8.2.5	Supply, installation and testing of pipes and specials as detailed in the pipe schedule	sum	1		
H.3	**PSG 8.10**	**BUILDING PIPES INTO CONCRETE WORK**				
		PIPES SUPPLIED AND INSTALLED BY THE CONTRACTOR (IRRESPECTIVE OF TYPE)				
H.3.1		150 mm dia	no	6		
H.3.2		300 mm dia	no	5		
H.3.3		400 mm dia	no	1		
H.4	**PSVA**	**LANDSCAPING AND GRASSING**				
H.4.1	8.1(b)	Trimming to receiving topsoil (both horizontal and sloping)	m²	650		
H.4.2	8.3(b)(i)	Topsoil 100 mm thick (obtained from the stockpile) on horizontal areas (top of embankment)	m²	500		
H.4.3		Same as item G.4.2 above but on areas sloping 1:2	m²	500		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
	8.3(d)	SUPPLYING AND APPLYING CHEMICAL FERTILIZER 2:3 (22) at 50g/m²				
H.4.4		On horizontal areas	kg	35		
H.4.5		On areas sloping 1:2	kg	25		
	8.4(a)	KIKUYU CUTTINGS				
H.4.6		On horizontal areas	m²	650		
H.4.7		On areas sloping 1:2	m²	500		
	8.4(b)	KIKUYU SODDING				
H.4.8		On horizontal areas	m²	100		
H.4.9		On areas sloping 1:2	m²	100		
H.5	**SANS 1200G**	**CONCRETE (STRUCTURAL)**				
		FORMWORK				
	8,2	ROUGH FORMWORK (MEASURED TO 150mm BELOW FINISHED GROUND LEVEL WHERE APPLICABLE)				
		PLANE VERTICAL				
H.5.1		Sides of mass concrete (provisional)	m²	5		
		SMOOTH FOMRWORK (MEASURED FROM 150mm BELOW FINISHED GROUND LEVEL WHERE APPLICABLE)				
	8.2.3	PLANE VERTICAL				
H.5.2		Sides of floors of boxes	m²	8		
H.5.3		Sides of concrete liner slabs (around pipe inlets and outlets)	m²	2		
H.5.4		External faces of walls of boxes (below ground)	m²	60		
		SPECIAL SMOOTH REPAIRED AND RUBBED FORMWORK (MEASURED FROM 150mm BELOW FINISHED GROUND LEVEL)				
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
	8.2.3	PLANE VERTICAL				
H.5.5		Internal and external faces of boxes (above ground level)	m²	95		
		PLANE HORIZONTAL				
H.5.6		Soffits of cover slabs	m²	5		
		SPECIAL FORMWORK				
	8.2.6	BOX OUT HOLES / FORM VOIDS				
H.5.7	(a)	Small, circular of diameter up to 0,35m, up to 0,5m deep	no	5		
H.5.8	(d)	Large, other than circular of area over 0,1m², up to 0,5m² deep	no	2		
H.6	**8,3**	**REINFORCEMENT**				
	8.3.2	HIGH TENSILE WELDED MESH				
H.6.1		Ref: 245	m²	13		
		HIGH TENSILE STEEL BARS				
H.6.2	8.3.1	Y25 mm dia.: basic price	t	3		
		EXTRA OVER ITEM G.6.2 (PROVISIONAL QUANTITIES) FOR BARS OF DIAMETER				
H.6.3		Y10 mm	t	1		
H.6.4		Y12 mm	t	1		
H.6.5		Y16 mm	t	0,5		
H.6.6		Y20 mm	t	0,5		
		MILD STEEL BARS				
H.6.7		R25mm dia.: basic price	t	0,25		
		EXTRA OVER ITEM G.6.7 (PROVISIONAL QUANTITIES) FOR BARS OF DIAMETER				
H.6.8		R8 mm	t	0,1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
H.6.9		R10 mm	t	0,1		
H.6.10		R12 mm	t	0,05		
H.7	**8,4**	**CONCRETE**				
		BLINDING LAYER IN GRADE 20/20 CONCRETE 50mm THICKNESS				
H.7.1		Horizontal	m²	25		
		STRENGTH CONCRETE 20/20				
H.7.2		Mass concrete where instructed by the engineer	m³	4		
		STRENGTH CONCRETE 20/10				
H.7.3		Benching in boxes	m³	2		
		STRENGTH CONCRETE 35/20				
H.7.4		Floor slabs boxes	m³	7		
H.7.5		Walls of boxes	m³	20		
H.7.6		Sloping floor panels (around pipe inlets)	m³	1		
		UNFORMED FINISHES				
H.7.7		To upper sufraces of concealed (under benching) work	m²	13		
		WOOD FLOAT FINISH				
H.7.8		Top of walls and boxes	m²	3		
		STEEL FLOAT FINISH				
		UPPER SURFACES OF				
H.7.9		Sloping floor panels	m²	8		
H.7.10		Benching in boxes	m²	13		
H.7.11		Floors of boxes	m²	16		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
	8.4.4(a)	WOOD-FLOATED FINISH				
H.7.12		Upper surfaces of sloping concrete paving	m²	8		
H.8	SANS	STRUCTURAL STEELWORK (SMALL WORK)				
H.8.1	8.3.2(b)	Galvanised handrail assembly complete	m	28		
	8.3.4(a)	3CR12 open grid steel flooring complete and installed with 3CR12 frames	m²	5		
H.8.2	8.3.4(a)	3CR12 chequer plate covers for 1000mm x 600mm openings	no	2		
	8.3.4(b)	COVER PLATES				
H.8.3		Supply and install Saint Gobain Aksess 700 lockable manhole cover to SANS 50124, into concrete cover slab	no	2		
		ALUMINIUM SLUICE GATES				
H.8.4		350 mm wide x 800 high 6mm thick (Gereg or similar approved) drip tight aluminium handstop with extended handles in 500 wide x 1095mm high frame to be installed centrally in concrete wall, handles to extend to 200mm above frame	no	2		
		GANTRY				
H.8.5		Supply and installation of heavy duty galvanised mild steel gantry for sludge pump station complete as shown	no	1		
H.9	**SANS 1200LD**	**SEWERS**				
	8.2.3	MANHOLES				
		MANHOLES 1000mm DIAMETER COMPLETE WITH TYPE 4 COVER AND FRAME FOR DEPTHS:				
H.9.1		Up to 2,0m	no	6		
H.10	8.2.20	PAINTING				
H.10.1		Paint galvanised handrail assembly complete, apply self-etch wash primer and two coats Plascon Valvaglo (or similar approved) paint. Stanchions in colour black and handrail tubing in colour golden yellow	m	28		
		CARRIED FORWARD				

CONTRACT NO

WINBURG WATER TREATMENT WORKS

SCHEDULE H: MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
PSD 8.6	PSD 8.6	EMPTY AND CLEAN EXISTING MATURATION PONDS				
	(a)	Pumping of water/sludge mixture to other structures within a distance of 500 meters	m^3	3600		
	(c)	Removal of non-pumpable sludge/soil mixture and disposal within the freehaul distance of 3.0km	m^3	3600		
		TOTAL FOR SCHEDULE H (CARRIED FORWARD TO SUMMARY)				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE J: REFURBISHMENT OF CLARI-FLOCCULATOR

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
J.1		**REFURBISHMENT OF CLARI-FLOCCULATOR**				
J.1.1		Empty and clean clari-flocculator, including removal of sludge to an approved site within 500 metres	sum	1		
J.1.2		Unblock sludge pipe between the centre of the tank and the sludge draw-off box	sum	1		
J.1.3		Unblock sludge pipe between the sludge draw-off box and the sludge ponds	sum	1		
J.1.4		Test structure for watertightness	sum	1		
J.1.5		**Concrete repairs**				
J.1.5.1		Floor				
		a) Remove Failed Concrete 50mm deep & Clean Surface	m^3	4		
		b) Apply SikTop Armatec 110 Prime (or similar approved)	m^2	80		
		c) Apply Sikacrete 214 (or similar approved)	m^3	4		
		d) Apply Sika Injection 203 (Pressured) (or similar approved)	m^3	0.001		
J.1.5.2		Walls				
		a) Remove Failed Concrete 50mm deep & Clean Surface	m^3	0.4		
		b) Apply SikTop Armatec 110 Prime (or similar approved)	m^2	20		
		c) Apply Sika Monotop 412 NFG (or similar approved)	m^3	1		
J.1.5.3		WALL & FLOOR				
		a) Sikadur Combiflex SG20 (200x2mm) with Sika 31 DW (or similar approved)	m	43		
J.1.5.4		FINAL COATING				
		Apply Coate of Sikagard 720 Epocem & Sikagard 63N	m^2	154		
J.1.5.5		Specialist to Manage repair of works, salary, vehicle & accomodation	Sum	1		
TOTAL FOR SCHEDULE J (CARRIED FORWARD TO SUMMARY)						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE K: RENOVATIONS TO OLD PUMPHOUSE BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
K.1		**PREPARATION**				
K.1.1		Preparation of old Walls. Remove old paint and wash inside of building with high pressure washer	Sum	1		
K.1.2		Supply all scaffolding inside and outside for painting purposes	Sum	1		
K.1.3		Clear all vegetation inside pump house and around the building. Including all vegetation ontop of the roof.	Sum	1		
K.1.4		Repair all concrete floors and walkways in and around the pump house were required	Sum	1		
K.2	**PS PB**	**TILING**				
K.2.1	8.2.5	Wall tiles (glazed ceramic) white	m²	28		
K.2.2	8.2.19 (a)	Vinyl floor tiles (2mm Marley Heavy Duty or similar approved)	m²	45		
K.2.3	8.2.5 (b)	Vinyl cove skirting	m	40		
K.2.4	8.2.5 (a)	300mm x 300mm heavy duty non slip floor tiles	m²	30		
K.2.5	8.2.5 (b)	100mm high heavy duty non slip tile skirting including cutting of tiles	m²	36		
K.3	8.2.18	REPLACE ALL OLD DOOR FRAMES AND DOORS WITH STEEL/ALLUMINUIM FRAMES AND WOODEN DOORS. PRICE TO INCLUDE THE BREAKING OUT OF OLD DOOR FRAMES.				
K.3.1		Door (900 x 2100 x 220 wall)	No	4		
K.3.2		Door (800 x 2100 x 220 wall)	No	2		
K.3.2		Door (900 x 2100 x 220 wall)	No	2		
K.3.3		Door (1800 x 2100 x 220 wall)	No	3		
K.3.4		Door (900 x 2400 x 220 wall)	No	3		
K.3.5		Door (3500 x 2900 x 220 wall)	No	1		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE K: RENOVATIONS TO OLD PUMPHOUSE BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
K.4		REPLACE ALL OLD WINDOW FRAMES WITH ALLUMINUIM FRAMES AND GLAZING. PRICE TO INCLUDE THE BREAKING OUT OF OLD DOOR FRAMES. NEW FRAMES TO INCLUDE BURGLAR BARS.				
K.4.1		Window (2370 x 340)	No	3		
K.4.2		Window (3600 x 1800)	No	4		
K.4.3		Window (1200 x 1900)	No	3		
K.4.4		Window (600 x 1900)	No	2		
K.4.5		Window (4800 x 1500)	No	2		
K.4.6		Window (5500 x 340)	No	6		
K.4.7		Window (2000 x 1600)	No	1		
K.4.8		Window (1500 x 600)	No	1		
K.4.9		Window (5200 x 600)	No	1		
K.5	**PSPB**	**JOINERY**				
	8.2.17	DOORS				
K.5.1		Door (900 x 2100 x 110 wall)	No	4		
K.5.2		Door (800 x 1200 x 110 wall)	No	2		
K.5.3		Door (900 x 2100 x 110 wall)	No	2		
K.5.4		Door (1800 x 2100 x 110 wall)	No	3		
K.5.5		Door (900 x 2400 x 110 wall)	No	3		
K.5.6		Door (3500 x 2900 x 110 wall)	No	1		
K.6	8.2.20	**PAINTING** PAINTING OF OLD WATER TREATMENT WORKS BUILDING				
K.6.1		Roof Slab (plascon double velvet)	m²	42		
K.6.2		Steel works and down pipes (plascon enamel)	m²	110		
		CARRIED FORWARD				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SCHEDULE K: RENOVATIONS TO OLD PUMPHOUSE BUILDING

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BROUGHT FORWARD				
K.6.3		Wooden doors (woodoc 50)	m²	25		
K.6.4		Outside Walls	m²	1250		
K.6.5		Inside Walls	m²	400		
K.7		PROVISIONAL ITEMS				
K.7.1		Supply and installation of office furniture inside the pump room offices	Prov. Sum	1	40000	R 40 000,00
K.7.2		Supply and installation of laboratory furniture and water testing equipment	Prov. Sum	1	40000	R 40 000,00
K.7.3		Appoint of a Structural expert to inspect and asses the integraty of the concrete roof at the existing Pump Room.	Prov. Sum	1	R240 000,00	R 240 000,00
K.7.4		Skim Coat and Fixing of Crack for the Roof Slab	Prov. Sum	1	R450 000,00	R 450 000,00
K.7.5		Add Contractor's charges onto the Provisional Sums	%			
		TOTAL FOR SCHEDULE K (CARRIED FORWARD TO SUMMARY)				

CONTRACT NO
WINBURG WATER TREATMENT WORKS

SECTION MA: PRELIMINARY AND GENERAL

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	Allow for all costs and expenses in connection with the following:				
MA1	Providing performance security.	Sum	1		
MA2	Providing insurance.	Sum	1		
MA3	Design of works and submission of Contractor's documents.	Sum	1		
MA4	Establishment on site.	Sum	1		
MA5	Setting out of work and checking work carried out by others.	Sum	1		
MA6	Liaison, co-operation and any necessary attendance upon the Client or other Contractors.	Sum	1		
MA7	General expenses incurred in complying with the requirements of T1.2: Tender Data, not included above.	Sum	1		
MA8	General expenses incurred in complying with the requirements of C1.2: Tender Data, not included above.	Sum	1		
MA9	Other general expenses incurred in complying with the requirements of the Scope of Work not included above (Specify).	Sum	1		
MA10	Preliminary and General Item for selected sub-contractor (Prov. Sum)	Prov. Sum	1	R 72 536,34	R 72 536,34
MA10.1	Contractor's mark up on Item MA10, specify percentage below and provide total in the amount. Percentage……..	%	R 72 536,34		
	TOTAL FOR SECTION MA CARRIED FORWARD TO SUMMARY				

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION MB: CHEMICAL DOSING EQUIPMENT

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R
	Allow for all costs and expenses in connection with the following:				
MB1	Allow for all costs and expenses for installed testing and repairs to installed dosing pumps by				
MB2	Completion of all pipework, valves, check valves, air release valves and strainers required for flocculant dosing purposes, as specified.	Sum	1		
MB3	Electrical control panel, level controller, cabling and all required electrical equipment.	Sum	1		
	Installation, testing, commissioning and maintenance during the Defects Liability Period of the following plant.				
MB10	Allow for operators to be trained in the operation and control of the plant, for a period of 72 hours only after successfully commissioning of the equipment.	Sum	1		
MB11	Allow for the cost of returning to site if ordered to carry out tests excluding visits required for the successful operation of the plant (per trip).	Sum	1		
MB12	Allow for Operating and Maintenance manuals for this Section of the contract.	Sum	1		
MB13	Allow for health and safety measures, plan and safety file for this Section of the contract.	Sum	1		
MB14	Allow for off-site storage of plant supplied under this Section of the contract, if and when ordered by the Engineer	Sum	1		
	(per day at R /day for 100 days)				
TOTAL FOR SECTION MA CARRIED FORWARD TO SUMMARY					

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION MC: FLOW METERS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R
	Supply and delivery to site of the following plant complete as specified.				
MC1	ONE 150mm NB straight in-line integrating flow meter for raw water complete as specified, including converter, duty data logger, spare data logger, lightning protection, electrical control panel and interconnecting cabling, all as specified. (Prov. Sum)	Prov. Sum	1	R 55 000,00	R 55 000,00
MC1.1	Contractor's mark up on Item MC1, specify percentage below and provide total in the amount. Percentage……..	%	R 55 000,00		
MC2	Pipework, valves, gaskets, bolts and nuts, flexible couplings, supports, etc., complete as specified and indicated on the drawings for meter in MC1 above. (Prov. Sum)	Prov. Sum	R 1,00	20000	R 20 000,00
MC2.1	Contractor's mark up on Item MC2, specify percentage below and provide total in the amount. Percentage……..	%	R 20 000,00		
MC3	ONE 150 NB straight in-line integrating flow meter for clear water complete as specified, including converter, duty data logger, spare data logger, lightning protection, electrical control panel and interconnecting cabling, all as specified.	Sum	1		
MC4	Pipework, valves, gaskets, bolts and nuts, flexible couplings, supports, etc., complete as specified and indicated on the drawings for meter in MC3 above.	Sum	1		
	Installation, testing, commissioning and maintenance during the Defects Liability Period of the following plant.				
MC5	Plant supplied under Items MC1 and MC2. (Prov. Sum)	Prov. Sum	1	7500	R 7 500,00
MC5.1	Contractor's mark up on Item MC5, specify percentage below and provide total in the amount. Percentage……..	%	7500		
MC6	Plant supplied under Items MC3 and MC4.				
MC7	Allow for the cost of returning to site if ordered to carry out tests excluding visits required for the successful operation of the plant (per trip). (Prov. Sum)	Prov. Sum	1	8290	R 8 290,00
MC7.1	Contractor's mark up on Item MC7, specify percentage below and provide total in the amount. Percentage……..	%	8290		
MC8	Allow for Operating and Maintenance manuals for this Section of the contract. (Prov. Sum)	Prov. Sum	1	7500	R 7 500,00
MC8.1	Contractor's mark up on Item MC8, specify percentage below and provide total in the amount. Percentage……..	%	7500		
MC9	Allow for health and safety measures, plan and safety file for this Section of the contract. (Prov. Sum)	Prov. Sum	1	7500	R 7 500,00
MC9.1	Contractor's mark up on Item MC9, specify percentage below and provide total in the amount. Percentage……..	%	7500		
MC10	Allow for off-site storage of plant supplied under this Section of the contract, if and when ordered by the Engineer	Sum	1		
TOTAL FOR SECTION MA CARRIED FORWARD TO SUMMARY					

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION MD: RAPID GRAVITY FILTRATION EQUIPMENT

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R
	Supply and delivery to site of the following plant complete as specified.				
MD1	Equipment for THREE rapid gravity filters, including media, distribution pipework within the filters, nozzles, false floor complete as specified	Sum	1		
MD2	TWO backwash water pump sets complete with motors, couplings, baseplates, holding down bolts and all equipment as specified	Sum	1		
MD3	Modification to existing air blower delivery pipework, complete as specified	Sum	1		
MD4	All interconnecting pipework, valves, control system and fittings necessary for operation of filter plant, all as specified	Sum	1		
MD5	ONE drainage pump (gland leakage) with pipework and level switches complete as specified	Sum	1		
	Installation, testing, commissioning and maintenance during the Defects Liability Period of the following plant				
MD6	Plant supplied under Item MD1	Sum	1		
MD7	Plant supplied under Item MD2	Sum	1		
MD8	Plant supplied under Item MD3	Sum	1		
MD9	Plant supplied under Item MD4	Sum	1		
MD10	Plant supplied under Item MD5	Sum	1		
MD12	Allow for operation of the plant supplied under this Section for a period of 72 hours, during which time the operators shall also be trained in the operation and control of the plant, only after successfully commissioning of the equipment	Sum	1		
MD13	Allow for the cost of returning to site if ordered to carry out tests excluding visits required for the successful operation of the plant (per trip)	Sum	1		
MD14	Allow for Operating and Maintenance manuals for this Section of the contract	Sum	1		
MD15	Allow for health and safety measures, plan and safety file for this Section of the contract.	Sum	1		
MD16	Allow for off-site storage of plant supplied under this Section of the contract, if and when ordered by the Engineer (per day at R /day for 100 days)	Sum	1		
TOTAL FOR SECTION MA CARRIED FORWARD TO SUMMARY					

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION ME: PUMPING EQUIPMENT

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R
	Supply and delivery to site of the following plant complete as specified.				
ME1	TWO inclined axial flow propeller type pumps, complete with motors, speed reducers (if applicable), shafts and all equipment as specified. (Wolwas Pumps) Pumps to be identical to the existing pumps and must be priced here as the Main Offer). Alternative offers TO be priced separately in the covering letter.	No	2		
ME2	Modifications to existing delivery pipework, as well as new pipework where required. (Prov. Sum)	Prov. Sum	1	55000	R 55 000,00
ME2.1	Contractor's mark up on Item ME2, specify percentage below and provide total in the amount. Percentage……..	%	55000		
ME3	TWO horizontal shaft raw water pump sets complete with motors, couplings, baseplates, holding down bolts and all equipment as specified (Raw Water Pumps). (Prov. Sum)	Prov. Sum	1	435363,37	R 435 363,37
ME3.1	Contractor's mark up on Item ME3, specify percentage below and provide total in the amount. Percentage……..	%	435363,37		
ME4	Complete replacement of existing suction and delivery pipework, including new valves, non return valves, flexible couplings, supports etc. (including new pressure gauges) for pumps in item ME3, complete as specified. (Prov. Sum)	Prov. Sum	1	55000	R 55 000,00
ME4.1	Contractor's mark up on Item ME4, specify percentage below and provide total in the amount. Percentage……..	%	55000		
ME5	TWO horizontal shaft clear water pump sets complete with motors, couplings, baseplates, holding down bolts and all equipment as specified (Clear Water Pumps)) Pumps to be identical to the existing pumps and must be priced here as the Main Offer) Alternative offers must be priced separately in the covering letter.	No	2		
ME6	Refurbishing of existing suction and delivery pipework, valves, flexible couplings, as well as new pressure gauges for pumps in item ME5.	Sum	1		
ME7	TWO submersible washwater return pumps, complete with motors, guide rails and lifting chains and all equipment as specified.	No	2		
ME8	Pipework, valves, flexible couplings, supports etc. (including pressure gauges) for pumps in item ME7, complete as specified.	Sum	1		
ME9	ONE drainage pump (gland leakage) with pipework and level switches complete as specified in the Raw Water Pump Station.	No	1		
ME10	ONE drainage pump (gland leakage) with pipework and level switches complete as specified in the Clear Water Pump Station.	No	1		
ME11	ONE set of lifting gear for the submersible sludge pump station (travelling trolley, block and tackle), complete as specified (Gantry supplied under civils). (Prov. Sum)	Prov. Sum	1	60000	R 60 000,00
ME11.1	Contractor's mark up on Item ME11, specify percentage below and provide total in the amount. Percentage……..	%	60000		
ME12	Additional miscellaneous equipment, as specified, but not specifically listed above				
	Installation, testing, commissioning and maintenance during the Defects Liability Period of the following plant.				
ME13	Plant supplied under Items ME1 and ME2. (Prov. Sum)	Prov. Sum	1	15000	R 15 000,00
ME13.1	Contractor's mark up on Item ME13, specify percentage below and provide total in the amount. Percentage……..	%	15000		
ME14	Plant supplied under Items ME3 and ME4. (Prov. Sum)	Prov. Sum	1	20000	R 20 000,00
ME14.1	Contractor's mark up on Item ME14, specify percentage below and provide total in the amount. Percentage……..	%	20000		
ME15	Plant supplied under Items ME5 and ME6.	Sum	1		
ME16	Plant supplied under Items ME7 and ME8.	Sum	1		
ME17	Plant supplied under Item ME9.	Sum	1		
ME18	Plant supplied under Item ME10.	Sum	1		
ME19	Plant supplied under Item ME11.	Sum	1		
ME20	Allow for operation of the plant supplied under this Section for a period of 72 hours, during which time the operators shall also be trained in the operation and control of the plant, only after successfully commissioning of the equipment. (Prov. Sum)	Prov. Sum	1	15000	R 15 000,00
ME20.1	Contractor's mark up on Item ME20, specify percentage below and provide total in the amount. Percentage……..	%	15000		
ME21	Allow for the cost of returning to site if ordered to carry out tests excluding visits required for the successful operation of the plant (per trip). (Prov. Sum)	Prov. Sum	1	7500	R 7 500,00
ME21.1	Contractor's mark up on Item ME21, specify percentage below and provide total in the amount. Percentage……..	%	7500		
ME22	Allow for Operating and Maintenance manuals for this Section of the contract. (Prov. Sum)	Prov. Sum		7500	
ME22.1	Contractor's mark up on Item ME22, specify percentage below and provide total in the amount. Percentage……..	%	7500		
ME23	Allow for health and safety measures, plan and safety file for this Section of the contract. (Prov. Sum)	Prov. Sum	1	7500	R 7 500,00
ME23.1	Contractor's mark up on Item ME23, specify percentage below and provide total in the amount. Percentage……..	%	7500		
ME24	Allow for off-site storage of plant supplied under this Section of the contract, if and when ordered by the Engineer (per day at R /day for 100 days)	Sum	1		
TOTAL FOR SECTION MA CARRIED FORWARD TO SUMMARY PAGE C.					

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION MF: CLARI-FLOCCULATOR EQUIPMENT

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R
	Supply and delivery to site of the following plant complete as specified.				
MF1	ONE new paddle mixer, complete with motor and speed reducer, all as specified, complete with extension to existing bridge to mount new mixer	No	1		
MF2	Refurbishment of ONE existing paddle mixer, including replacement of motor and speed reducer, all as specified	No	1		
MF3	Refurbishment of rotating bridge drive, including replacement of motor and speed reducer, all as specified	Sum	1		
MF4	New electrical control panel for paddle mixers and bridge drive, including cabling.	Sum	1		
MF5	Replacement of sludge valve, complete with electric actuator.	Sum	1		
MF6	New electrical control panel for actuated valve, including cabling.	Sum	1		
MF7	Refurbishment of existing rotating bridge assembly and scrapers, all as specified	Sum	1		
MF8	Additional miscellaneous equipment, as specified, but not specifically listed above	Sum	1		
	Installation, testing, commissioning and maintenance during the Defects Liability Period of the following plant				
MF9	Plant supplied under Item MF1	Sum	1		
MF10	Plant supplied under Item MF2	Sum	1		
MF11	Plant supplied under Item MF3	Sum	1		
MF12	Plant supplied under Item MF4	Sum	1		
MF13	Plant supplied under Item MF5	Sum	1		
MF14	Plant supplied under Item MF6	Sum	1		
MF15	Plant supplied under Item MF7	Sum	1		
MF16	Plant supplied under Item MF8	Sum	1		
MF17	Allow for operation of the plant supplied under this Section for a period of 72 hours, during which time the operators shall also be trained in the operation and control of the plant, only after successfully commissioning of the equipment	Sum	1		
MF18	Allow for the cost of returning to site if ordered to carry out tests excluding visits required for the successful operation of the plant (per trip)	Sum	1		
MF19	Allow for Operating and Maintenance manuals for this Section of the contract	Sum	1		
MF20	Allow for health and safety measures, plan and safety file for this Section of the contract	Sum	1		
MF21	Allow for off-site storage of plant supplied under this Section of the contract, if and when ordered by the Engineer (per day at R /day for 100 days)	Sum	1		
MF22	Allow Prov. Sum for Specialist Design, manufacture, supply and delivery for replacement of Rotating Bridge assemby, including Two (2) paddle mixers with motor and speed reducer; Rotating Bridge Drive motor and speed reducer; Scrapers. All as specified	Prov. Sum	1	R 1 500 000,00	R 1 500 000,00
MF23	Contractor's mark up on Item MF22, specify percentage below and provide total in the amount. Percentage……..	%	1500000		
TOTAL FOR SECTION MF CARRIED FORWARD TO SUMMARY PAGE C.					

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION MG: CHLORINATION EQUIPMENT

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R
	Supply and delivery to site of the following plant complete as specified.				
MG1	TWO wall-mounted chlorination units complete with auto change over, heating system, including two control valves and injectors and all accessories as specified.	Sum	1		
MG2	TWO emergency chlorine shut-off systems.	Sum	1		
MG3	THREE booster pumps complete as specified.	Sum	1		
MG4	All interconnecting pipework, valves, diffusers, etc., all as specified.	Sum	1		
MG5	TWO 68 kg load cells, all as specified.	Sum	1		
MG6	ONE lifting gear and trolley complete as specified.	Sum	1		
MG7	Wind direction indicator, as specified.	Sum	1		
MG8	Complete chlorine gas leakage detection system, including fans, all as specified.	Sum	1		
MG9	Safety equipment and warning signs, as specified.	Sum	1		
MG10	Additional miscellaneous equipment, as specified, but not specifically listed above (including GRP Safety Box)	Sum	1		
	Installation, testing, commissioning and maintenance during the Defects Liability Period of the following plant.				
MG11	Plant supplied under Item MG1.	Sum	1		
MG12	Plant supplied under Item MG2.	Sum	1		
MG13	Plant supplied under Item MG3.	Sum	1		
MG14	Plant supplied under Item MG4.	Sum	1		
MG15	Plant supplied under Item MG5.	Sum	1		
MG16	Plant supplied under Item MG6.	Sum	1		
MG17	Plant supplied under Item MG7.	Sum	1		
MG18	Plant supplied under Item MG8.	Sum	1		
MG19	Plant supplied under Item MG9.	Sum	1		
MG20	Plant supplied under Item MG10.	Sum	1		
MG21	Allow for operation of plant supplied under this Section for a period of 72 hours, during which time operators shall be trained in the operation and control of the plant, only after successfully commissioning of equipment.	Sum	1		
MG22	Allow for cost of returning to site if ordered to carry out tests excluding visits required for the successful operation of the plant (per trip).	Sum	1		
MG23	Allow for Operating and Maintenance manuals for this Section of the contract.	Sum	1		
MG24	Allow for health and safety measures, plan and safety file for this Section of the contract.	Sum	1		
MG25	Allow for off-site storage of plant supplied under this Section of the contract, if and when ordered by the Engineer (per day at R /day for 100 days)	Sum	1		
TOTAL FOR SECTION MG CARRIED FORWARD TO SUMMARY PAGE C.					**R -**

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION EA: PRELIMINARY AND GENERAL

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
					R / c
	Preliminary and General items related to the electrical equipment and not included in the Bills of Materials				
EA1	All contractual requirements	Sum	1		
EA2	All overhead costs	Sum	1		Incl. Above
EA3	Three sets of Operating and Maintenance Manuals, including “As Built” drawings	Sum	1		
EA4	Liaison and co-ordination with other contractors	Sum	1		
EA5	Occupational Health & Safety Act requirements, including safety plan, safety file and all measures required (see Appendix B).	Sum	1		
EA6	All other obligations (specify)				
	…… …… …… …… …… …… …… …… …… …… …… …… …… ……				
EA7	Preliminary and General Item for selected sub-contractor (Prov. Sum)	Prov	Sum	R 49 000,00	R 49 000,00
EA7.1	Contractor's mark up on Item EA7.1, specify percentage below and provide total in the amount. Percentage……..	%	49000		
TOTAL FOR SECTION EA CARRIED FORWARD TO SUMMARY					

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION EB: ELECTRICAL POWER CABLES

ITEM	FROM – TO	CABLE mm2 x core Cu / Al	BCEC mm2	TOTAL LENGTH (m)	RATE		AMOUNT
					Supply	Inst	R / c
EB1	**Water Treatment Works MCC**						
EB1.1	Pump 1	95 x 4 Cu	132	15			
EB1.2	Pump 2	95 x 4 Cu	132	15			
EB1.3	Blower 1	10 x 4 Cu		Existing			
EB1.4	Blower 2	10 x 4 Cu	44	15			
EB1.5	Drainage Pump	10 x 4 Cu		Existing			
EB1.6	Rietfontein Pump Station	120 x 4 Al		420	Prov. Sum		R 95 592,00
EB1.6.1	Contractor's mark up on Item EB1.6.1. Percentage……						
EB1.7	Recycle Pump Station	35 x 4 Al	75	175			
EB1.8	DB Admin Building	10 x 4 Cu	44	45			
EB1.9	Chlorine Store	4 x 3 Cu	33	55			
EB1.10	DB Dosing	4 x 4 Cu	33	75			
EB1.11	Settling / Mixer	4 x 4 Cu	33	80			
EB1.12	WTW Fresh Water Chamber Level Sensor Full / Empty (Low)	4 x 4 Cu	33	55			
EB1.13	Recycle Pump Station MCC Interposing Relay	4 x 4 Cu	33	175			
EB1.14	Rietfontein (Dam) Pump Station MCC Interposing Relay	4 x 4 Cu		420	Prov. Sum		R 23 751,00
EB1.14.1	Contractor's mark up on Item EB1.14.1. Percentage……						
EB1.15	Interposing Relay	1 x 1.5 Cu		In Panel	Prov. Sum		R 1 500,00
EB1.15.1	Contractor's mark up on Item EB1.15.1. Percentage……						
EB2	**Rietfontein (Dam) Pump Station MCC**						
EB2.1	Interposing Relay Pump Inhibit / Stop	1 x 1.5 Cu		In Panel	Prov. Sum		R 1 500,00
EB2.1.1	Contractor's mark up on Item EB2.1. Percentage……						
EB2.2	Interposing Relay Pump Running	1 x 1.5 Cu		In Panel	Prov. Sum		R 1 500,00
EB2.2.1	Contractor's mark up on Item EB2.2. Percentage……						
EB3	**Wolwas Pump Station MCC**						
EB3.1	Pump 1	50 x 4 Al	83	15			
EB3.2	Pump 2	50 x 4 Al	83	15			
EB4	**Winburg Central reservoir**						
EB4.1	Level Sensor Full / Not-Full	4 x 4 Cu	33	25			
EB5	**CABLES NOT MENTIONED ABOVE, BUT DEEMED NECESSARY TO COMPLETE THE INSTALLATION IN FULL WORKING ORDER**						
	…… …… …… …… …… …… …… ……						
TOTAL CARRIED OVER TO ITEM CABLES: SCHEDULE OF PRICES							

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION EC: EXCAVATIONS FOR CABLES

ITEM	Route	600mm wide x 800mm deep in linear meter	RATE			AMOUNT
			Excavate	Supply	Backfill	R / c
EC1	**Water Treatment Works MCC to**					
EC1.1	**Riefontein Pump Station**					
EC1.1.1	Pickable soil	260	Prov. Sum			R 28 600,00
EC1.1.1.1	Contractor's mark up on Item EC1.1.1 Percentage……					
EC1.1.2	Soft Rock	60	Prov. Sum			R 10 800,00
EC1.1.2.1	Contractor's mark up on Item EC1.1.2 Percentage……					
EC1.1.3	Hard Rock	25	Prov. Sum			R 14 000,00
EC1.1.3.1	Contractor's mark up on Item EC1.1.3 Percentage……					
EC1.1.4	Bedding 200mm thick in linear meters for a trench 600mm wide	315	Prov. Sum			R 18 900,00
EC1.1.4.1	Contractor's mark up on Item EC1.1.4 Percentage……					
EC1.2	**Recycle Pump Station**					
EC1.2.1	Pickable soil	175		XXXX		
EC1.2.2	Soft Rock			XXXX		
EC1.2.3	Hard Rock			XXXX		
EC1.2.4	Bedding 200mm thick in linear meters for a trench 600mm wide	170	XXXX			
EC1.3	**DB Admin Building**					
EC1.3.1	Pickable soil	15	240	XXXX		
EC1.3.2	Soft Rock	30	720	XXXX		
EC1.3.3	Hard Rock			XXXX		
EC1.3.4	Bedding 200mm thick in linear meters for a trench 600mm wide	40	XXXX			
EC1.4	**Chlorine Store**					
EC1.4.1	Pickable soil	20		XXXX		
EC1.4.2	Soft Rock	35		XXXX		
CARRIED FORWARD						

BROUGHT FORWARD						
EC1.4.3	Hard Rock			XXXX		
EC1.4.4	Bedding 200mm thick in linear meters for a trench 600mm wide	40	XXXX			
EC1.5	**DB Dosing**					
EC1.5.1	Pickable soil	40	240	XXXX		
EC1.5.2	Soft Rock	35		XXXX		
EC1.5.3	Hard Rock			XXXX		
EC1.5.4	Bedding 200mm thick in linear meters for a trench 600mm wide	75	XXXX			
EC1.6	**Settling / Mixer**					
EC1.6.1	Pickable soil	40		XXXX		
EC1.6.2	Soft Rock	35		XXXX		
EC1.6.3	Hard Rock			XXXX		
EC1.6.4	Bedding 200mm thick in linear meters for a trench 600mm wide	75	XXXX			
EC1.7	**WTW Fresh Water Chamber Level Sensor Full / Empty (Low)**					
EC1.7.1	Pickable soil	40		XXXX		
EC1.7.2	Soft Rock	15		XXXX		
EC1.7.3	Hard Rock			XXXX		
EC1.7.4	Bedding 200mm thick in linear meters for a trench 600mm wide	55	XXXX			
EC1.8	**EXCAVATIONS NOT MENTIONED ABOVE, BUT DEEMED NECESSARY TO COMPLETE THE INSTALLATION IN FULL WORKING ORDER**					
	…… …… …… …… …… …… …… …… ……					
TOTAL CARRIED OVER TO ITEM CABLES: SCHEDULE OF PRICES						

CONTRACT NO
WINBURG WATER TREATMENT WORKS

SECTION ED: MCC ALTERATIONS AND NEW MCCS

ITEM	Description of work item	Unit of Measure	Quantity	RATE		AMOUNT
				Supply	Inst	R / c
ED1.	**Water Treatment Works MCC Alterations**					
ED1.1	1 x 10A 2-pole, 10kA, supply and install in MCC	Each	1			
ED1.2	1 x 100A 3-pole, 10kA CB, supply and install in MCC	Each	1			
ED1.3	3 x Insulated Terminal / Busbars, Terminal Interface to Feeder Cable. Tails: From Circuit Breaker to Terminal / Busbar: 25mm² per phase colour coded Cu PVC.Feeder cable: 120mm² Al 4-core PVC/SWA/PVC Bi metal lugs required	Sum	1			
ED1.4	1 x 100A 3-pole, 10kA CB, supply and install in MCC	Each	1			
ED1.5	1 x 60A 3-pole, 10kA CB, supply and install in MCC	Each	1			
ED1.6	1 x 10A 2-pole, 10kA, supply and install in MCC	Each	1			
ED1.7	1 x 25A 3-pole, 10kA CB, supply and install in MCC	Each	1			
ED1.8	1 x 25A 2-pole, 10kA, supply and install in MCC	Each	1			
ED1.9	Interposing Relays (230V, 2 x N/C + 2 x N0O), supply and install in MCC including all small wiring to complete the integration	Each	4			
ED1.10	Adjustable Timers 0-30min, 230V, supply and install, Control / delay automatic Stop, including all small wiring to complete the integration	Each	3			
ED1.11	Removal of the old MCC (lower level)	Sum	1			
ED2.	**Rietfontein (Dam) Pump Station MCC Alterations**					
ED2.1	Interposing Relays (230V, 2 x N/C + 2 x N0O), supply and install in MCC including all small wiring to complete the integration Pump Inhibit / Stop	Prov. Sum	1			R 75 000,00
ED2.1.1	Contractor's mark up on Item ED2.1	%		R	75 000,00	
ED2.2	Interposing Relays (230V, 2 x N/C + 2 x N0O), supply and install in MCC including all small wiring to complete the integration Pump Running	Prov. Sum	1			R 75 000,00
ED2.2.1	Contractor's mark up on Item ED2.2	%		R	75 000,00	
ED3.	**Wolwas Pump Station MCC New Complete MCC**					
ED3.1	MCC, supply and install including the decommissioning and removal of the old panel and re-connecting all necessary cables	Sum	1			
	CABLES NOT MENTIONED ABOVE, BUT DEEMED NECESSARY TO COMPLETE THE INSTALLATION IN FULL WORKING ORDER					
	Extension of electrical panel to accommodate extra circuit breakers…… …… …… ……					
	Conduit, cable racks etc…… …… …… …… …… …… ……					
TOTAL CARRIED OVER TO ITEM MCC Alterations and New MCCs: SCHEDULE OF PRICES						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION EF: TELEMETRY

ITEM	Description of work item	Unit of Measure	Quantity	RATE		AMOUNT
				Supply	Inst	R / c
EF1.	**Water Treatment MCC**					
EF1.1	Supply and install the complete telemetry system with the required I/O, Controlled etc. as specified, this includes all cabling, sundry supplies, antenna, programming and telemetry radio and integration with the MCC	Sum	1			
EF2.	**Rietfontein (Dam) Pump Station MCC Alterations**					
EF2.1	Supply and install the complete telemetry system with the required I/O, Controlled etc. as specified, this includes all cabling, sundry supplies, antenna, programming and telemetry radio and integration with the MCC and Water Treatment MCC Telemetry	Prov. Sum	1			R 49 100,00
EF2.1.1	Contractor's mark up on Item EF2.1	%		R	49 100,00	
EF3.	**Winburg Central Reservoir**					
EF3.1	Supply and install the complete telemetry system with the required I/O, Controlled etc. as specified, this includes all cabling, sundry supplies, antenna, programming and telemetry radio and integration with the Water Treatment MCC Telemetry	Sum	1			
	TELEMETRY NOT MENTIONED ABOVE, BUT DEEMED NECESSARY TO COMPLETE THE INSTALLATION IN FULL WORKING ORDER					
	…… …… …… …… …… …… …… ……					
TOTAL CARRIED OVER TO ITEM TELEMETRY: SCHEDULE OF PRICES						

CONTRACT NO
WINBURG WATER TREATMENT WORKS
SECTION: EG GENERAL ITEMS

ITEM	DESCRIPTION OF WORK ITEM	UNIT OF MEASURE	Quantity	AMOUNT R / C
EG1.	**PROVISIONAL SUMS**			
EG1.1	Electrical installation , renovating portions of the existing water treatment main building	SUM		
EG1.2	Electrical installation of for the new administration building	SUM		
EG1.3	Electrical installation of for the new chlorine store	SUM		
EG1.4	Electrical installation of for the new dosing building	SUM		
EG1.5	Electrical installation , renovating portions of the existing Rietfontein pump station	PROV SUM		R 12 000,00
EG1.6	Alterations to the security / safety fence around the water treatment transformer	SUM		
EG2.	**CERTIFICATES OF COMPLIANCE FOR THE ELECTRICAL INSTALLATIONS**			
EG2.1	Water treatment works main building (renovated portion) and mcc	SUM	1	
EG2.2	Water treatment works new administration building	SUM	1	
EG2.3	Water treatment works new chlorine store	SUM	1	
EG2.4	Water treatment works new dosing building	SUM	1	
EG2.5	Rietfontein pump station (renovated portion) and mcc	PROV SUM	1	R 2 000,00
EG3.	**CABLE ROUTE TRACING AT WATER TREATMENT PLANT**			
EG3.1	Tracing of cables between the water treatment transformer and the water treatment mcc	SUM	1	
EG3.2	Tracing of cables between the water treatment mcc and the various water treatment installations	SUM	1	
EG3.3	Tracing of cables between the water treatment mcc and the Rietfontein pumps station walkway	PROV SUM	1	R 4 000,00
EG3.3.1	Contractor's mark up on Item EG3.3 Percentage……	%	R 4 000,00	
EG3.4	Groundwater Source Development to augement potable water supply to Winburg WTW	PROV SUM	R 1,00	R 18 000 000,00
EG3.4.1	Contractor's mark up on Item EG3.4 Percentage……	%	R 18 000 000,00	
	ITEMS NOT MENTIONED ABOVE, BUT DEEMED			
EG4	……..…… ……..…… ……..…… …… …… ……			
TOTAL CARRIED OVER TO ITEM GENERAL ITEMS: SCHEDULE OF PRICES				

SUMMARY OF SCHEDULES

CIVIL SUMMARY

SCHEDULE	DESCRIPTION	AMOUNT
A	PRELIMINARY AND GENERAL	R -
B	GENERAL SITE WORKS	R -
C	CHEMICAL DOSING BUILDING	R -
D	RAPID GRAVITY SAND FILTERS	R -
E	CHLORINATION BUILDING	R -
F	ADMINISTRATION BUILDING	R -
G	INTERCONNECTING PIPEWORK AND MANHOLES	R -
H	MODIFICATIONS TO EXISTING SLUDGE HOLDING PONDS	R -
J	REFURBISHMENT OF CLARI-FLOCCULATOR	R -
K	RENOVATIONS TO OLD PUMPHOUSE BUILDING	R -
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF SCHEDULES - a		R -

MECHANICAL SUMMARY

SECTION	DESCRIPTION	AMOUNT
MA	PRELIMINARY AND GENERAL	R -
MB	CHEMICAL DOSING EQUIPMENT	R -
MC	FLOW METERS	R -
MD	RAPID GRAVITY FILTRATION EQUIPMENT	R -
ME	PUMPING EQUIPMENT	R -
MF	CLARI_FLOCCULATOR EQUIPMENT	R -
MG	CHLORINATION EQUIPMENT	R -
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF SCHEDULES - b		R -

ELECTRICAL SUMMARY

SECTION	DESCRIPTION	AMOUNT OF WORK DONE
EA	PRELIMINARY AND GENERAL	R -
EB	ELECTRICAL POWER CABLES	R -
EC	EXCAVATIONS FOR CABLES	R -
ED	MCC ALTERATIONS AND NEW MCCS	R -
EF	TELEMETRY	R -
EG	GENERAL ITEMS	R -
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF SCHEDULES - c		R -

SUB-TOTAL (a + b + c)	R -
Add 10% Contingencies	R -
SUB-TOTAL with Contingencies	R -
Add 15% VAT	R -
TOTAL TENDER AMOUNT CARRIED FORWARD TO THE FORM OF OFFER	R -