Province of the
EASTERN CAPE
PUBLIC WORKS & INFRASTRUCTURE

TENDER

TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

NAME OF COMPANY: _____

CSD Nr: _____

CRS Nr (CIDB): _____

CLOSING DATE: 20 JUNE 2024 **TIME: 11:00 am**

Department of Public Works and Infrastructure
Independence Avenue
Qhasana Building
Bhisho
5605

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THE TENDER

PART T1 TENDERING PROCEDURES

T1.1: TENDER NOTICE AND INVITATION TO TENDER

T1.1 TENDER NOTICE AND INVITATION TO TENDER

The Eastern Cape Department of Public Works and Infrastructure invites contractors with a CIDB Grading of **8CE or higher** in the following Class of works (**CE)** to tender for **"TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS"** for an **18 Months'** contract. The contract will be based on the GCC 2015, 3rd Edition and the Eastern Cape Public Works and Infrastructure will enter into a contract with the successful tenderer.

Only tenderers who have suitable experience and suitably qualified personnel in providing similar services to those that are required are eligible to submit tenders.

Bid documents are downloadable free of charge from Department of Public Works and Infrastructure website (www.ecdpw.gov.za/tenders) or from National Treasury's tender portal (http://www.etender.gov.za/content/advertised-tenders). Bid documents will be available on **17 May 2024**. No bid documents will be available at departmental offices.

There will be **a compulsory** briefing meeting on **27 May 2024**, at **Tafalofefe Hospital, Centani**. Prospective bidders to meet **at the main entrance of the site at 11h00.**

Queries relating to the issue of these documents may be addressed in writing to SCM email: supply.chain@ecdpw.gov.za **Technical enquiries:** may be addressed in writing to **Mr. M. Ngamlana**– email: Mkanyiseli.Ngamlana@ecdpw.gov.za

The closing time for receipt of tenders by the ECDPWI is **11:00am** on **20 June 2024**. Telegraphic, telephonic, telex, facsimile, e-mail and late tenders will not be accepted. Bids must be submitted in sealed envelopes clearly marked **"SCMU5-24/25-0037: "TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS"** must be deposited in the bid box, **DEPARTMENT OF PUBLIC WORKS, FRONT CORNER OF QHASANA BUILDING ON THE WAY TO CIDB OFFICES LABELLED "TENDERS", BISHO.**

It is the responsibility of the tenderer/s to ensure that bid documents /proposals are submitted on or before closing time and the correct location as the department will not take responsibility of wrong delivery. Tenderers using courier services for delivery of their bid documents must ensure the delivery is at the correct place / location and time as the department will not be held responsible for wrong delivery. Not delivered to Departmental officials. The Department will not accept responsibility if bids received by officials are not timely deposited in the Bid Box.

Tenders may only be submitted on the tender documentation that is issued. Tenderers must be registered on the National Treasury Central Supplier Data Base and proof of registration must be submitted with the proposal (https://secure.csd.gov.za). Requirements for sealing, addressing, delivery, opening and assessment of tenders are stated in the Tender Data.

B. BID EVALUATION:
This bid will be evaluated in Three (3) phases as follows:

Phase One: Functionality will be applied as a prequalification criterion. Such criteria are used to establish minimum requirements where after bids will be evaluated solely on the basis of price and preference
Phase Two: Compliance, responsiveness to the bid rules and conditions, thereafter they will be evaluated on Functionality.
Phase Three: Bidders passing all stages above will thereafter be evaluated on PPPFA.

PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT (PPPFA) POINTS WILL BE AWARDED AS FOLLOWS:

Maximum points on price	-	**90 or 80 points**
Maximum points Specific Goals	**-**	**10 or 20 points**
Maximum points	**-**	**100 points**

C. BID SPECIFICATIONS, CONDITIONS AND RULES
The minimum specifications, other bid conditions and rules are detailed in the bid document under Tender Data

The Department of Public Works and Infrastructure SCM policy applies.

Tender validity period is **120 days.**

D. TENDER SUBMISSIONS:
Bids must be submitted in sealed envelopes clearly marked **"SCMU5-24/25-0037": "TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS"** must be deposited in the bid box, **DEPARTMENT OF PUBLIC WORKS, FRONT CORNER OF QHASANA BUILDING ON THE WAY TO CIDB OFFICES LABELLED "TENDERS", BISHO**.

E. ENQUIRIES WITH REGARD TO THIS ADVERT MAY BE DIRECTED TO:

- **SCM RELATED ENQUIRIES**
  Email Address: supply.chain@ecdpw.gov.za
  TECHNICAL ENQURIES
  Mr. M. Ngamlana
  Tel No: **040 602 4014**
  Email Address: Mkanyiseli.Ngamlana@ecdpw.gov.za

FOR COMPLAINTS, FRAUD, & TENDER ABUSE:
Call: 0800 701 701

PART T1.2: TENDER DATA

T1.2 TENDER DATA

The conditions of tender are the latest edition of SANS 10845-3, *Standard conditions of tender*.
SANS 10845-3 makes several references to the Tender Data for details that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the provisions of SANS 10845-3 *and* as contained in **Annexure C** of **Standard for Uniformity in Construction Procurement (Board Notice 423 of 2009 Government Gazette No 42622 of August 2019)**.
Each item of data given below is cross-referenced to the clause in SANS 10845-3 to which it mainly applies.

Clause number	Tender Data
3.1	The Employer is Public Works and Infrastructure
3.2	The tender documents issued by the employer comprise the following documents: **THE TENDER** **Part T1: Tendering procedures** T1.1 - Tender notice and invitation to tender T1.2 - Tender data T1.3 – Tender Functionality **Part T2: Returnable documents** T2.1 - List of returnable documents T2.2 - Returnable schedules **THE CONTRACT** **Part C1: Agreements and Contract data** C1.1 - Form of offer and acceptance C1.2 - Contract data C1.3 - CIDB Adjudicators Agreement C1.4 - Performance Guarantee **Part C2: Pricing data (Annexure A – A1 to A74)** C2.1 - Pricing Instructions C2.2 - Bills of Quantities C2.3 – Pricing Summary **Part C3: Scope of work (Annexure B – B1 to B351)** C3.1 – Project Specifications: Civil and M&E C3.2 – Project Particular Specifications: Civil and M&E C3.3 – Electrical Surveillance Specification C3.4 – Electrical Specification C3.5 – Indoor Generator Specification C3.6 – Fire detection specification C3.7 – EMP C3.8 – EPWMP Specification C3.9 – Health and Safety Project Specification C3.10 – Drawing Register
3.3	The tender documents issued by the employer comprise the documents listed on the contents page
3.4	The employer's agent is: Name: Mr Likhaya Nkonki Carifro Consulting Engineers 6 Belgrave Road, Belgravia East London, 5201 Tel: 043 743 8266 Email: likhaya@carifro.com The employers Engineer is: Name: Mr JPC van Wyk CSE Consulting (Pty) Ltd First Floor, 7B Derby Road, Berea East London, 5241 Tel: 043 726 3565 Email: el@cse-consult.co.za
3.5	The language for communications is English
3.6	The competitive negotiation procedure shall be applied.
3.7	Method 3: Three (3) stage procurement procedure shall be applied.

4	**Tender's obligations**
4.1	The following tenderers who are registered with the CIDB, or are capable of being so registered prior to the evaluation of submissions, are eligible to have their tenders evaluated: a) contractors who have a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered, or a value determined in accordance with Regulation 25 (1B) of 25(7A) of the Construction Industry Development Regulations, for a CIDB **Grade 8CE or higher** class of construction work; and Joint ventures are eligible to submit tenders provided that: 1. Every member of the joint venture is registered with the CIDB; 2. the lead partner has a contractor grading designation in the grade **7CE** class of construction work; 3. the combined contractor grading designation calculated in accordance with the Construction industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a CIDB **Grade 8CE or higher** class of construction work or a value determined in accordance with Regulation 25 (1B) of 25(7A) of the Construction Industry Development Regulations. 4. Joint Venture Agreement.
4.2	The employer will compensate the tender as follows GCC 2015, 3rd Edition, the employer **will not** compensate the tenderer for any costs incurred in attending interviews or making any submissions in the office of the employer.
4.3	It is the responsibility of the tenderer to check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.
4.4	**Confidentiality and copyright of documents** Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.
4.5	Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are incorporated into the tender documents by reference.
4.6	Acknowledge receipt of addenda to the tender documents, which the employer may issue, and, if necessary, apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.
4.7	The arrangements for a compulsory clarification meeting are as stated in the Tender Notice and Invitation to Tender. Tenderers must sign the attendance list in the name of the tendering entity. Addenda will be issued to and tenders will be received only from those tendering entities appearing on the attendance list. **Tender documents will not be made available at the clarification meeting**
4.8	**Seek clarification** *Request clarification of the tender documents, if necessary, by notifying the employer at least* ***5 (Five) working days*** ***before the closing time stated in the tender data.***
4.9	Tenderers are required to state the rates and currencies in Rands. Include in the rates, prices, and the tendered total of the prices (if any), all duties, taxes which the law requires to be paid [except value added tax (VAT)], and other levies payable by the successful tenderer, that are applicable 14 days before the closing time stated in the tender data. Show the VAT payable by the employer separately as an addition to the tendered total of the prices. Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data. State the rates and prices in monetary value of the contract unless otherwise instructed in the tender data.
4.10	Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer or to correct errors made by the tenderer and ensure that all signatories to the tender offer initial all such alterations. Do not make erasures using masking fluid.

4.11	Main tender offers are not required to be submitted together with alternative tenders.
4.12	No alternative tender offers will be considered
4.13.1	Parts of each tender offer communicated on paper shall be submitted as an original. Submit a) the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with a translation of any documentation in a language other than the language of communication established in 3.5, and b) The parts communicated electronically by the employer of its agents on paper format with the tender.
4.13.2	Sign the original and all copies of the tender offer where required in terms of the tender data. State in the case of a joint venture which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer. NOTE The employer holds all authorized signatories liable on behalf of the tenderer.
4.13.3	A tender security in the amount of **N/A** is required and shall remain valid for a period not exceeding N**/A** days after the closing date for tender offers. The form of the tender security shall not differ substantially from the sample provided in Annex D of SANS 10845-3.
4.13.4	The employer's details and address for delivery of tender offers and identification details that are to be shown on each tender offer package are: **Location of tender box: DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE, FRONT CORNER OF QHASANA BUILDING ON THE WAY TO CIDB OFFICES LABELLED "TENDERS", BISHO**. **Physical address:** Independence avenue, Ground Floor, Qhasana Building, Bhisho 5605 **Identification details: SCMU5-24/25-0037: "TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS"** **Closing time and date: 20 June 2024** at **11:00**
4.13.5	The tenderer is required to submit with his tender the following certificates: 1) A copy of the CSD report showing, amongst other things, that tax matters of the service provider are in order the South African Revenue Services. *In the case of a Joint Venture/Consortium/Sub-contractors each party must submit a separate* CSD report showing, amongst other things, that tax matters of the service provider are in order the South African Revenue Services. 2) CIDB Grading certificate or CRS number.
4.13.6	A two-envelope procedure will not be required.
4.13.7	Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted. The tenderer accepts that the employer does not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.
4.14	The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender. Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Proof of posting shall not be accepted as proof of delivery. Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of the standard conditions of tender in this part of SANS 10845 apply equally to the extended deadline.
4.15.1	The tender offer validity period is **120 days**. Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data. If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period, with or without any conditions attached to such extension. Extend the period of the tender security, if any, to cover any agreed extension requested by the employer.
4.15.2	**Placing of contractors under restrictions / withdrawal of tenders** If any tenderer who has submitted a tender offer or a contractor who has concluded a contract has, as relevant: withdrawn such tender or quotation after the advertised closing date and

	time for the receipt of submissions; after having been notified of the acceptance of his tender, failed or refused to commence the contract; had their contract terminated for reasons within their control without reasonable cause; offered, promised or given a bribe in relation to the obtaining or the execution of such contract; acted in a fraudulent, collusive or anti-competitive or improper manner or in bad faith towards the Provincial Government; or, made any incorrect statement in any affidavit or declaration with regard to a preference claimed and is unable to prove to the satisfaction of the Provincial Government that the statement was made in good faith or reasonable steps were taken to confirm the correctness of the statements, such tenderer/s may be placed under restriction from tendering with the state. Procedures are outlined in the EC SCM Policy for Infrastructure procurement and Delivery Management and also on **CIDB** Inform Practice Note #30. Excerpts of the policy can be availed on request of any interested tenderer.
4.16	Access shall be provided for the following inspections, tests and analysis: **N/A**
4.17	the preferred tenderer will be required to submit an approved insurer undertaking to provide the Performance Bond / Guarantee / Surety / Security to the format and/or standard as specified.
5	**Employer's undertakings**
5.1	The Employer will respond to requests for clarification received up to **Five (5)** working days before the tender closing time. If, as a result of the issuing of addenda, it is necessary to extend the closing time stated in the tender data, grant such extension and notify all respondents accordingly.
5.2	The employer shall issue addenda until **Five (5)** working days before tender closing time.
5.3	Tenders will be opened immediately after the closing time for tenders at **11:00am hours.**
5.4	Do not disclose to tenderers, or to any person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.
5.5	Determine, after opening and before detailed evaluation, whether each tender offer that was properly received a) complies with the requirements of the standard conditions of tender in this part of SANS 10845, b) has been properly and fully completed and signed, and c) is responsive to the other requirements of the tender documents. A responsive tender is one that conforms to all the terms, conditions, and scope of work of the tender documents, without material deviation or qualification. A material deviation or qualification is one which, in the employer's opinion, would d) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the scope of work, e) significantly change the employer's or the tenderer's risks and responsibilities under the contract, or f) affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified. Reject a non-responsive tender offer, and do not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.
5.6	**Arithmetical errors, omission and discrepancies** Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern. For Vat related discrepancies, National and Provincial Treasury prescripts in relation to VAT procedures apply.
5.7.1	The financial offer will be reduced to a comparative basis using the Tender Assessment Schedule.

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

Formula	Comparison aimed at achieving	Option 1[a]	Option 2[a]
1	Highest price or discount	$A = \left(1 + \frac{(P - P_m)}{P_m}\right)$	$A = P/P_m$
2	Lowest price or percentage commission / fee	$A = \left(1 - \frac{(P - P_m)}{P_m}\right)$	$A = P_m/P$
a	P_m is the comparative offer of the most favourable comparative offer. P is the comparative offer of the tender offer under consideration.		

5.7.2 The procedure for the evaluation of responsive tenders is **Method 3: Administrative, Quality, Price and Preference**
Phase 1: Functionality eligibility of bidder to meet minimum requirements.
Phase 2: Administrative requirements and Mandatory requirements.
Phase 3: Price and preference (90/10 or 80/20 system).

1. *PHASE ONE: FUNCTIONALITY ELIGIBILITY OF BIDDER TO MEET MINIMUM REQUIREMENTS*

Functionality will be applied as a prequalification criterion. Such criteria are used to establish minimum requirements where after bids will be evaluated solely on the basis of price and preference.

Functionality Criteria	Sub-criteria	Weighting
Demonstrated experience (past performance) in comparable similar projects – Water and Sanitation Projects	Project References	70 points
Qualifications and Experience	Contracts Manager	30 points with a minimum of 15
	Site Agent	
TOTAL POINTS		**MAX 100 Points**

Scoring criteria for functionality is detailed in Table A1: Indicators for scoring of functionality criteria.

Minimum combined weighted point threshold must equal (60/100 points) for further consideration of the tender. Please note that it is compulsory that a minimum of 15 points be scored for "Qualifications and Experience" for a tender to be considered further. Even if a total score exceeds 60/100, the tender will not be considered further.

2. PHASE TWO: RESPONSIVENESS TO THE BID REQUIREMENTS AND RULES

A. Bidders' proposals must meet the following minimum requirements and supporting documents must be submitted with the completed bid document in a sealed envelope in the bid box at the closing date and time. Failure to comply will automatically eliminate the bid for further consideration:

1. Bid Document (This Document must be submitted in its original format)
2. Bids which are late, incomplete, unsigned or submitted by facsimile or electronically, will not be accepted.

	3. Bidder must be registered with CIDB in the correct grading and class of works as per the tender notice and requirements. And must the status on CIDB be active during award stage. It is the responsibility of the bidder to keep the status on CIDB active throughout bidding process (advert till award stage). 4. Bidders must be a legal entity. 5. Form of offer and Acceptance (fully completed and signed) 6. SBD4 must be duly completed and signed. Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract, such interest must be disclosed on question 2.3.1. 7. Compulsory Enterprise Questionnaire (Completed and signed) (JV partners must complete separate Questionnaire forms and submit). 8. If the offer is "Vat Inclusive", the VAT registration number of service provider must be indicated and if a service provider is not a VAT Vendor but include VAT in its prices, the successful service provider will be given 21 days to register as a VAT Vendor with SARS, after the issuing of an appointment letter. If a bidder is a VAT vendor/registered, the bidder is required to explicitly state the VAT amount. VAT vendors must include VAT at 15% in the bid offer(s). 9. Resolution to Sign (if applicable) 10. Attendance of compulsory briefing meeting 11. This tender will be awarded as a whole. All trades listed in the Bills of Quantities or Pricing schedule must be priced for (except provisional sums and allowances), failure to do so will result increase commercial risk of the bid and may lead to elimination or passing over of the bidder. 12. Bidder must submit a proof that shows an experience on construction of water and waste water treatment plant. Failure to do so will lead to elimination.
	B. Other Conditions of bid (Non eliminating unless expressly mentioned in the document): 13. DPWI Policy applies. 14. Returnable Schedule: SBD1-Invitation to bid must be completed and signed 15. The bidder must be registered on the Central Supplier Database (CSD) prior the award 16. All bidders' tax matters must be in order prior award. Bidders' tax matters will be verified through CSD. 17. Declaration of Employees of the State or other State Institutions. 18. Bidders must submit a minimum of three (3) written contactable references for projects successfully completed in the past (clearly indicating client name, contract value, contract term, contact person, contact details). Refer to Annexure I and Annexure M. This is not an elimination factor, but important for the department to make a decision. Unless it is used for Quality/functionality Points. 19. Bidders must submit a list of projects where he or she has submitted tender offers but tender results have not been confirmed by the client. Refer to Annexure L. This is not an elimination factor, but important for the department to make a decision. Unless it is used for Quality/functionality Points. 20. Bidders must submit their company profiles, list of available resources, plant and machinery and any other additional capacity with the bid. Refer to Annexure K and H. This is not an elimination factor, but important for the department to make a decision. Unless it is used for Quality/functionality Points. 21. The bidder must also list all projects where there are pending litigations or litigations have been concluded. The form for this is also attached after Annexure J. 22. The Department will contract with the successful bidder by signing a formal contract. 23. This tender will be awarded as a whole. All trades listed in the Bills of Quantities or Pricing schedule must be priced for (except provisional sums and allowances which also need to be added to the total), failure to do so will increase commercial risk of the bid and may lead to elimination or passing over of the bidder.

24. Wherever a brand name is specified in this document (i.e. specifications, pricing schedule, bill of quantities or anywhere), the department requires an item similar/equivalent or better.
25. DPWI Policy applies.
26. Protection of personal information: Consent (POPIA)
27. The successful tenderer (after being informed) will be required to bring along an unsigned copy of the form of contract to be signed by parties.
28. Contractor must commit to support and allocate to SMMEs (EME /QSEs which are at least 51% owed by Black people) within the Amatole District municipality region. The work packages to be implemented by the local SMMEs are already set or allocated in the Bills of Quantities of the project as provisional sum that a contractor will price only Profit and Attendance for. The responsibility to sub-contract with competent and capable sub-contractor's rests with the main contractor/supplier. Once awarded, to bring harmony on site, the department reserves the right to intervene in the selection of local sub-contractors or SMMEs on site.

3. <u>PHASE THREE: EVALUATION POINTS ON PRICE AND SPECIFIC GOALS / PPPFA OF 2022</u>

The **90/10 or 80/20 preference point system** shall be applied for the purposes of this bid as per the requirements of the *Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000)* and PPPFA Regulations *of 2022*

Criteria	Points
POINTS ON PRICE	**90 or 80**
SPECIFIC GOALS	**10 or 20**
TOTAL	**100**

Please note:

1. Bidders need to complete and sign SBD 6.1 to claim points for specific goals. Failure will lead in non-awarding of points for specific goals.
2. The Department intends to award this to the highest point scorer as whole, unless circumstances justify otherwise.
3. All information will be verified through CSD.
4. SBD 6.1 is attached.

The 90/10 preference point system for acquisition of services, works or goods exceeding Rand value of R50 million:

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

The financial offer will be scored using the following formula:

	A = (1 – (P – Pm)) Pm The value of value of W_1 is: 1) **90** where the financial value inclusive of VAT of all responsive tenders received have a value in **excess of R50 000 000** or 2) **80** where the financial value inclusive of VAT of one or more responsive tender offers have a value that **equals or is less than R 50 000 000**.
5.7.3	The procedure for the evaluation of responsive tenders is **Method 3** (Administrative, price and preference)
5.7.4	The quality criteria and maximum score in respect of each of the criteria are as follows: **T1.3 Table A1: Functionality Criteria Score**
5.8	**Tender offers will only be accepted if:** a) the tenderer is registered on the Central Supplier Database (CSD) for the South African government (see https://secure.csd.gov.za/) unless it is a foreign supplier with no local registered entity b) the tenderer is in good standing with SARS according to the Central Supplier Database. Bidders must submit a CSD no. or tax status compliance pin. c) the preferred tenderer will be required to submit an approved insurer undertaking to provide the Performance Bond / Guarantee / Surety / Security to the format and/or standard as per DPW policy. d) the tenderer is registered with the Construction Industry Development Board in an appropriate contractor grading designation; e) the tenderer or any of its directors/shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector. f) the tenderer has not: i) abused the Employer's Supply Chain Management System; or ii) failed to perform on any previous contract and has been given a written notice to this effect. g) the tenderer has completed the Compulsory Declaration and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process. h) the tenderer has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process and persons in the employ of the state are permitted to submit tenders or participate in the contract; i) Bids which are late, incomplete, unsigned or submitted by facsimile or electronically will not be accepted. j) the tenderer is registered and in good standing with the compensation fund or with a licensed compensation insurer; k) The tenderer undertakes to maximize the sourcing of building material or infrastructure input material from Eastern Cape based suppliers or manufacturers. l) the employer is reasonably satisfied that the tenderer has in terms of the Construction Regulations, 2014, issued in terms of the Occupational Health and Safety Act, 1993, the necessary competencies and resources to carry out the work safely. m) The tender has offered a market related offer. If the offer is believed not to be market related, the department through its Supply Chain Management bid committees will attempt to negotiate the offer with identified bidder/s to a reasonable amount. Bidders are not allowed to increase their tender offers during this process.

	n) A Resolution of signatory form has been completed and signed by director/s or a letter bearing a letterhead of the tenderer has been attached (specific to this bid) to the bid submission; it must be duly signed by all directors and submitted the bid. Only a duly authorized official can sign the bid. o) Prospective bidders must register on CSD prior submitting bids (open tenders). Any prospective bidder found to have Tax matters not in order with SARS (verified through CSD) during the evaluation process (after being given an opportunity to rectify tax matters) will be eliminated and not be considered further in the process. Preferred bidder/s will be afforded an opportunity to rectify their tax affairs within 7 days. A bidder that fails to rectify its tax matters with SARS will be eliminated.
	p) **NOTE:** The amount reflected on the Form of Offer and Acceptance takes precedence over any other total amount indicated elsewhere in bidder's tender submission. If the Form of Offer and Acceptance has no value or figure, the bidder will be regarded as having made no offer. q) The department reserves the right not to award the bid to the most favourable tenderer, if any of the situations occur: if it is not assisting in the advancement of designated groups; risk profile of the favourable firm is too high; the bidder has been awarded a considerable number of projects by the department or provincial government; has performed unsatisfactorily in the past, etc.
5.9	The number of paper copies of the signed contract to be provided by the employer is 1. The additional conditions of tender are: • Wherever a brand name is specified in this document (i.e., specifications, pricing schedule, bill of quantities or anywhere), the department requires an item similar/equivalent or better.
T.2.1	List of returnable documents
1	**Documentation to demonstrate eligibility to have tenders evaluated i.e.** *List all documentation to demonstrate eligibility to have a submission evaluated.* • Appropriate CIDB grading suitable for the works (as stated in 4.1).
2	**Returnable Schedules required for tender evaluation purposes** The tenderer must fully and appropriately complete and sign the following returnable schedules as relevant: • Record of Addenda to Tender Documents • Proposed amendments and qualifications • Compulsory Enterprise Questionnaire (In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted). • SBD 1, 4, 6.1, . Protection of personal content: Consent • Form of Offer and Acceptance • Complete priced Bills of Quantities, including Final Summary • Certificate of Authority for Joint Ventures
3	**Other documents required for tender evaluation purposes** The tenderer must provide the following returnable documents: • A CSD Report for a contractor with valid and correct information. • A letter if good standing from the Compensation Fund or a licensed insurer as contemplated in the Compensation for Occupational Injuries and Diseases Act 1993 (Act No. 130 of 1993)
4	**Returnable Schedules that will be used for tender evaluation purposes and be incorporated into the contract** The tenderer must complete the following returnable documents: • A duly completed form of Offer and Acceptance (and any revision of prices if there are any).

5	**Only authorized signatories may sign the original and all copies of the tender offer where required.** • In the case of a **ONE-PERSON CONCERN** submitting a tender, this shall be clearly stated. • In the case of a **COMPANY** submitting a tender, include a copy of a **resolution by its board of directors** authorizing a director or other official of the company to sign the documents on behalf of the company. • In the case of a **CLOSE CORPORATION** submitting a tender, include a copy of a **resolution by its members** authorizing a member or other official of the corporation to sign the documents on each member's behalf. • In the case of a **PARTNERSHIP** submitting a tender, **all the partners** shall sign the documents, unless one partner or a group of partners has been authorized to sign on behalf of each partner, in which case **proof of such authorization** shall be included in the Tender. • In the case of a **JOINT VENTURE/CONSORTIUM** submitting a tender, include **a resolution of each company** of the joint venture together with a **resolution by its members** authorizing a member of the joint venture to sign the documents on behalf of the joint venture. • **Accept that failure to submit proof of authorization to sign the tender shall result in the tender offer being regarded as non-responsive.**
6	**Information and data to be completed in all respects** Accept that tender offers, which do not provide all the data or information requested completely and, in the form, required, may be regarded by the employer as nonresponsive.
7	**Canvassing and obtaining of additional information by tenderers** The Tenderer shall not make any attempt either directly or indirectly to canvass any of the Employer's officials or the Employer's agent in respect of his tender, after the opening of the tenders but prior to the Employer arriving at a decision thereon. The Tenderer shall not make any attempt to obtain particulars of any relevant information, other than that disclosed at the opening of tenders.
8	**Prohibitions on awards to persons in service of the state** The Employer is prohibited to award a tender to a person - a) who is in the service of the state; or *b)* if that person is not a natural person, of which any director, manager, principal shareholder or stakeholder is a person in the service of the state; or *c)* a person who is an advisor or consultant contracted with the Department or municipal entity. **In the service of the state** means to be - a) a member of:- *a* any municipal council; *b* any provincial legislature; or *c* the National Assembly or the National Council of Provinces; *d)* a member of the board of directors of any municipal entity; *e)* an official of any Department or municipal entity; *f)* an employee of any national or provincial department; *g)* provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999); *h)* a member of the accounting authority of any national or provincial public entity; or *i)* an employee of Parliament or a provincial legislature. In order to give effect to the above, the questionnaire for the declaration of interests in the tender of persons in service of state in part T2 of this procurement document must be completed.

9	**Awards to close family members of persons in the service of the state** Accept that the notes to the Employer's annual financial statements must disclose particulars of any award of more than R2000 to a person who is a spouse, child, or parent of a person in the service of the state (defined in clause 8 above), or has been in the service of the state in the previous twelve months, including - *a)* the name of that person; *b)* the capacity in which that person is in the service of the state; and *c)* the amount of the award. In order to give effect to the above, the questionnaire for the declaration of interests in the tender of persons in service of state in part T2 of this procurement document must be completed.
10	**Respond to requests from the tenderer** The employer will respond to requests for clarification up to **7 (seven) working days** before the tender closing time.
11	**Opening of tender submissions** Tenders will be opened immediately after the closing time for tenders
12	**Scoring quality / functionality:**
13	**Cancellation and re-invitation of tenders** An organ of state may, prior to the award of the tender, cancel the tender if- (a) due to changed circumstances, there is no longer a need for the services, works or goods requested; or (b) funds are no longer available to cover the total envisaged expenditure; or (c) no acceptable tenders are received. (d) Tender validity period has expired. (e) Gross irregularities in the tender processes and/or tender documents. (f) No market related offer received (after attempts of negotiation processes) Where applicable, the decision to cancel the tender will be published in the CIDB website and in the Tender Bulletin or the media in which the original tender invitation as advertised.
14	Dispute resolution mechanism will be done through the **Adjudication** route**.**
15	The department must when be acting against the tenderer or person awarded the contract on a fraudulent basis, considers the provisions of Regulation 14: The remedies provided for in Preferential Procurement Regulations 2017 do not prevent an institution from instituting remedies arising from any other prescripts or contract.
16	Where the employer terminates the contract due to default of the contractor in whole or in part, the employer may decide to: a) Refer the breach in contract to the **cidb** for investigation as a breach of the **cidb Code of Conduct** in terms of the **cidb Regulations**; or b) may impose a restriction penalty on the contractor in terms of Section 14 of the Preferential Procurement Regulations. The outcomes of such investigations in terms of both the cidb Regulations and the Preferential Procurement Regulations may prohibit the contractor from doing business with the public sector for a period not exceeding 10 years.



T 1.3: FUNCTIONALITY SCORING SCHEDULES

Table A1: FUNCTIONALITY CRITERIA SCORE

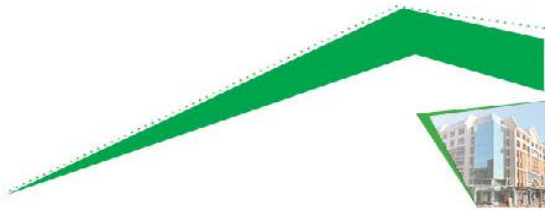
Functional Criteria		Sub-criteria		Requirements from Tenderers
		Description	**Max Points**	
COMPANY EXPERIENCE				
Demonstrated experience (past performance) in comparable projects – Water and Sanitation Projects **70**		Project Reference: No References	0 points	This criterion covers the experience and knowledge that the Tenderer has with working on other construction projects that are comparable in terms of complexity, size, value and construction durations. Tenderers are to provide details on Water and waste water treatment projects with the highest value that have been completed (or awarded) in the past 5 years. Tenderers MUST provide company profiles. **Tenderers MUST have Project Reference Forms (Form T2.21) from a previous employers or consultants that they have worked with or are currently working with. The value of projects will be determined from the Project Reference Forms. At least three forms must be submitted to prove sufficient experience, but the one with the highest will be used for scoring.**
		Project References below R20 million	30 points	
		Project Reference above R20 million and below R30 million	50 points	
		Similar Project Reference above R30 million	70 points	
PERSONNEL				
A minimum of a total of 15 points scored for the following for the tender to be considered further				
Qualifications and Experiences of Key Personnel **30**	Contracts Manger(Engineer)	Contract Manager registered as a Professional Engineer (Civil or Structural) or Professional Technologist with ECSA	15 points	The Tenderers are to provide information that covers the level of qualifications, competency **(specific to the Contract Manager and Site Agent.** Please provide copies of qualifications and Refer to Form T2.20
		Contract Manager which is a Technician with Diploma in Civil Eng	10 points	
		Contracts Manager with no registration or qualification mentioned above	0 points	
	Site Agent	Site Agent registered as a Professional Engineer (Civil or Structural) or Professional Technologist with ECSA with minimum of 5 years' experience.	15 points	
		Site Agent with which is a Technician with Diploma in Civil Eng and minimum of 5 Years' Experience in project of similar nature.	10 points	
		Site Agent with a Trade Certificate and minimum 5 years of experience as a site agent	5	
		Site Agent no registration or qualification relevant to the building industry	0	



Functional Criteria	Sub-criteria		Requirements from Tenderers
	Description	Max Points	
TOTAL POINTS	Minimum point threshold must equal **(60/100 points)** for further consideration of the tender	**100 points**	

PART T2 RETURNABLE DOCUMENTS

PART T2: LIST OF RETURNABLE DOCUMENTS



T2 LIST OF RETURNABLE DOCUMENTS

The tenderer must complete the following returnable documents:

1 Returnable Schedules required for quotation evaluation purposes

- Compulsory enterprise questionnaire (In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted).
- Record of addenda issued (Only if addenda is issued)
- Certificate of authority for joint ventures (Only where the tender/ quotation is submitted by a joint venture)

2 Other documents required for quotation evaluation purposes

- Form of Offer and Acceptance
- Complete Priced Bills of Quantities & Final Summary

3 Returnable Schedules that will be incorporated into the contract

- Details of the Project Team and CV with Qualifications & Proof of Registration completed for each individual proposed
- Schedule of Plant and Equipment
- Record of projects: current, past and on tender.
- Project References – at least 3
- SBD 1, 4, 6.1,
- Protection of personal content: Consent
- Subcontract agreement (where applicable) or intent to sub-contract as per requirements.

T2.1 SBD 1

PART A INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE					
BID NUMBER:	**SCMU5-24/25-0037**	CLOSING DATE:	**20 JUNE 2024**	CLOSING TIME:	11:00
DESCRIPTION:	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**				

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT
DEPARTMENT OF PUBLIC WORKS, FRONT CORNER OF QHASANA BUILDING ON THE WAY TO CIDB OFFICES LABELLED **"TENDERS"**, BHISHO.

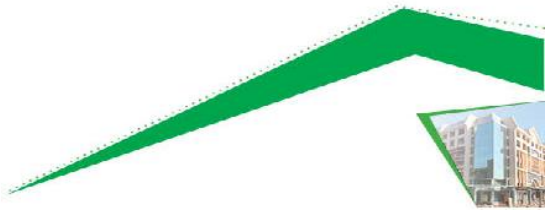
BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO		TECHNICAL ENQUIRIES MAY BE DIRECTED TO:	
CONTACT PERSON		CONTACT PERSON	**Mkanyiseli Ngamlana**
TELEPHONE NUMBER		TELEPHONE NUMBER	**040 602 4014**
FACSIMILE NUMBER		FACSIMILE NUMBER	
E-MAIL ADDRESS	supply.chain@ecdpw.gov.za	E-MAIL ADDRESS	Mkanyiseli.ngamlana@ecdpw.gov.za

SUPPLIER INFORMATION					
NAME OF BIDDER					
POSTAL ADDRESS					
STREET ADDRESS					
TELEPHONE NUMBER	CODE		NUMBER		
CELLPHONE NUMBER					
FACSIMILE NUMBER	CODE		NUMBER		
E-MAIL ADDRESS					
VAT REGISTRATION NUMBER					
SUPPLIER COMPLIANCE STATUS	TAX COMPLIANCE SYSTEM PIN:		**OR**	CENTRAL SUPPLIER DATABASE No:	MAAA

(a) ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐Yes ☐No [IF YES ENCLOSE PROOF]	**a)** ARE YOU A FOREIGN BASED SUPPLIER FOR **THE GOODS /SERVICES /WORKS OFFERED?**	☐Yes ☐No [IF YES, COMPLETE QUESTIONNAIRE BELOW]

QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS	
IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO
DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO
IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 BELOW.



PART B

TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:
1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.
1.2. **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED – (NOT TO BE RE-TYPED) OR IN THE MANNER PRESCRIBED IN THE BID DOCUMENT.**
1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.
1.4. **THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (SBD7).**
2. TAX COMPLIANCE REQUIREMENTS
2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS.
2.3 APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA.
2.4 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.5 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED; EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.6 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.
2.7 NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE, COMPANIES WITH DIRECTORS WHO ARE PERSONS IN THE SERVICE OF THE STATE, OR CLOSE CORPORATIONS WITH MEMBERS PERSONS IN THE SERVICE OF THE STATE."

SIGNATURE OF BIDDER: ……

CAPACITY UNDER WHICH THIS BID IS SIGNED: ……
(Proof of authority must be submitted e.g. company resolution)

DATE: ……

T2.2 COMPULSORY ENTERPRISE QUESTIONNAIRE

The following particulars must be furnished. In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted.

Section 1: Name of enterprise: . . . . . .

Section 2: VAT registration number, if any: . . . . . .

Section 3: CIDB registration number, if any: . . . . . .

Section 4: Particulars of sole proprietors and partners in partnerships

Name*	**Identity number***	**Personal income tax number***

***** *Complete only if sole proprietor or partnership and attach separate page if more than 3 partners*

Section 5: Particulars of companies and close corporations

Company registration number . . . . . .

Close corporation number . . . . . .

Tax reference number . . . . . .

Section 6: The attached SBD 4 must be completed for each tender and be attached as a tender requirement.

Section 7: The attached SBD 6.1 must be completed for each tender and be attached as a requirement.

The undersigned, who warrants that he / she is duly authorized to do so on behalf of the enterprise:

i) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my / our tax matters are in order;
ii) confirms that the neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004; iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;
iv) confirms that I / we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest; and
iv) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

Signed _____ Date _____

Name _____ Position _____

T2.3 SBD 4
BIDDER'S DISCLOSURE

1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

2. Bidder's declaration

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest[1] in the enterprise, employed by the state?

YES/NO

2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name of State institution

2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution?

YES/NO

2.2.1 If so, furnish particulars:

……
……

2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract?

YES/NO

2.3.1 If so, furnish particulars:

……
……

[1] ***the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.***

3 DECLARATION

I, the undersigned, (name)…… in submitting the accompanying bid, do hereby make the following statements that I certify to be true and complete in every respect:

3.1 I have read and I understand the contents of this disclosure;

3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;

3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium[2] will not be construed as collusive bidding.

3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.

3.4 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.

3.6 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

Signed _____ Date _____

Name _____ Position _____

[2] ***Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.***

T2.4 SBD 6.1

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

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

NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022

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1. GENERAL CONDITIONS

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

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

1.2 To be completed by the organ of state

a) The applicable preference point system for this tender is the 90/10 preference point system.

b) The lowest acceptable tender will be used to determine the accurate system once tenders are received.

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

(a) Price; and

(b) Specific Goals.

1.4 To be completed by the organ of state:

The maximum points for this tender are allocated as follows:

	POINTS	POINTS
PRICE	80	90
SPECIFIC GOALS	20	10
Total points for Price and SPECIFIC GOALS	**100**	**100**

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

1.6 The organ of state reserves the right to require of a tenderer, either before a tender is

adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

(a) **"tender"** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;

(b) **"price"** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;

(c) **"rand value"** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

(d) **"tender for income-generating contracts"** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions; and

(e) **"the Act"** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

3. FORMULA FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

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

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

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

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

Where

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

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

3.2.1. POINTS AWARDED FOR PRICE

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

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

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

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

4. POINTS AWARDED FOR SPECIFIC GOALS

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

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

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

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

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

Table 1: Specific goals for the tender and points claimed are indicated per the table below.
(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.
***Note to tenderers: The tenderer must indicate how they claim points for each preference point system.*)**

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (To be completed by the tenderer)
Historically Disadvantaged Individual:-			
(a) 100% black ownership	3	6	
(b) 51% to 99% black ownership	2	4	
(c) Less than 51% black ownership	0	0	
Black women ownership:-			
(a) 100% black women ownership	2	4	
(b) 30% to 99% black women ownership	1	2	
(c) Less than 30% black women ownership	0	0	
Black youth ownership:-			
(a) 100% black youth ownership	2	4	
(b) 30% to 99% black youth ownership	1	2	
(c) Less than 30% black youth ownership	0	0	
People with disability:-			
(a) 20% or more disabled people ownership	2	4	
(b) Less than 20% disabled people ownership	0	0	
Locality:-			
(a) Within the Eastern Cape	1	2	
(b) Outside the Eastern Cape	0	0	

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm……

4.4. Company registration number: ……..

4.5. TYPE OF COMPANY/ FIRM

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

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

i) The information furnished is true and correct;

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

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

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

(a) disqualify the person from the tendering process;

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

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

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

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

……

SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME: ……..

DATE: ……

ADDRESS: ……

……

T2.12 CSD REGISTRATION

PROOF OF REGISTRATION ON THE NATIONAL TREASURY CENTRAL SUPPLIER DATABASE (CSD REPORT)

(ATTACH HERE)

T2.13 CIDB REGISTRATION

VALID CIDB CERTIFICATE OF A TENDERER

(ATTACH HERE)

T2.14 POPIA CONSENT

PROTECTION OF PERSONAL INFORMATION:

The introduction of The Protection of Personal Information Act (POPIA) ensures the regulation of personal information through its entire life cycle of collection, transfer, storing and deletion.
As part of its business activities, the Department of Public Works and Infrastructure obtains and requires access to personal data from a wide range of internal and external parties, including without limitation bidders who respond to requests for proposals that are published by the Department of Public Works and Infrastructure from time to time. The Department of Public Works and Infrastructure confirms that it shall process the information disclosed by Bidders for the purpose of evaluating and subsequently awarding/appointing a successful Bidder.

The Department of Public Works and Infrastructure hereby states that it does not and will never modify, amend, or alter any personal information submitted to it by a Bidder. Not unless directed to do so by an order of court, the Department of Public Works and Infrastructure does not disclose or permit the disclosure of any personal information to any Third Party without the prior written consent of the owner of the information.

Similarly, Bidders will from time-to-time access and be seized with information of a personal nature pertaining to the Department of Public Works and Infrastructure. Some of the information may because of legislative compliances be available in the public domain, whilst some is uniquely provided to bidders in pursuit of procurement or other business-related activities. In this regard, the Department of Public Works and Infrastructure requires that Bidders which receive or have access to its personal information, process any such information in a manner compliant with the requirements of the POPIA.

AGREEMENT

1. The Department of Public Works and Infrastructure and the Bidder (the Parties) agree and undertake that upon obtaining and having access to personal information relating to either of them, they shall always ensure that:
   a) They process the information only for the express purpose for which it was obtained.
   b) Information is provided only to designated and authorized personnel who require the personal information to carry out the Parties' respective obligations in terms of the Procurement processes.
   c) They will introduce, and implement all reasonable measures ensure the protection of all personal information from unauthorized access and/or use.
   d) They have taken appropriate measures to safeguard the security, integrity, and authenticity of all personal information in its possession or under its control.
   e) The Parties agree that if personal information will be processed for any other purpose other than the one for which the accessing of the information was intended, explicit written consent will be obtained prior to the execution of such reason.
   f) The Parties shall carry out regular assessments to identify all reasonably foreseeable internal and external risks to the interception of personal information in its possession or under its control and shall implement and maintain appropriate controls in mitigation of such risks.

2. The Parties agree that they will promptly return or destroy any personal data in their possession or control which belongs to the other Party once it no longer serves the purpose for which it was collected, subject to any legal retention requirements. The information will be destroyed in such a manner that it cannot be reconstructed to its original form, linking it to any individual or organization.

3. Bidder's Obligations

a) The Bidder is required to notify the Information Officer of Department of Public Works and Infrastructure, in writing as soon as possible after it becomes aware of or suspects any loss, unauthorized access or unlawful use of any of the Department of Public Works and Infrastructure's personal information.
b) The Bidder shall, at its own cost, promptly and without delay take all necessary steps to mitigate the extent of the loss or compromise of personal data.
c) The Bidder shall be required to provide the Department of Public Works and Infrastructure with details of the persons affected by the compromise and the nature and extent of the compromise, including details of the identity (if known) of the unauthorized person who may have accessed or acquired the personal data.
d) The Bidder undertakes to co-operate with any investigation relating to security breach which is carried out by or on behalf of Department of Public Works and Infrastructure.

On behalf of the Bidder:

Signed _____ Date _____

Position _____ Name of Bidder _____

On behalf of the Client:

Signed _____ Date _____

Position _____ Name of Client Representative _____

T2.15 RECORD OF ADDENDA TO BID DOCUMENTS

PROJECT TITLE	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU NUMBER	**SCMU5-24/25-0037**

I / We confirm that the following communications received from the Department of Public Works before the submission of this tender offer, amending the tender documents, have been taken into account in this bid offer: (Attach additional pages if more space is required)

Item	Date	Title or Details	No. of Pages
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Attach additional pages if more space is required.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____ _____

T2.16 PROPOSED AMENDMENTS AND QUALIFICATIONS

PROJECT TITLE	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU NUMBER	**SCMU5-24/25-0037**

The Tenderer should record any deviations or qualifications he may wish to make to the tender documents in this Returnable Schedule. Alternatively, a tenderer may state such deviations and qualifications in a covering letter to his tender and reference such letter in this schedule.

The Tenderer's attention is drawn to clause 5.8 of SANS 10845-3 regarding the employer's handling of material deviations and qualifications.

Page	Clause /Item	Proposal

The undersigned, who warrants that she/ he is duly authorised to do so on behalf of the enterprise, confirms that the content of this schedule that presented by the tenderer are within my personal knowledge and are to the best of my knowledge both true and correct

Signed _____ Date _____ _____

Name _____ Position _____ _____

Tenderer _____

T2.17 RESOLUTION FOR SIGNATORY

A: CERTIFICATE OF AUTHORITY FOR SIGNATORY

Signatory for companies shall confirm their authority hereto by attaching a duly signed and dated copy of the relevant resolution of the board of directors to this form or on company letter head.

An example is given below:

"By resolution of the board of directors passed at a meeting held on _____

Mr/Ms _____, whose signature appears below, has been duly authorised to

sign all documents in connection with the tender for Contract No. _____

and any Contract which may arise there from on behalf of (Block Capitals) _____

_____

_____

SIGNED ON BEHALF OF THE COMPANY: _____

IN HIS/HER CAPACITY AS: _____

DATE: _____

SIGNATURE OF SIGNATORY: _____

WITNESSES:

DIRECTOR (NAMES)		SIGNATURE	
DIRECTOR (NAMES)		SIGNATURE	
DIRECTOR (NAMES)		SIGNATURE	
DIRECTOR (NAMES)		SIGNATURE	
DIRECTOR (NAMES)		SIGNATURE	
DIRECTOR (NAMES)		SIGNATURE	

If you cannot complete this form, attach a separate sheet (in a company letter head, project specific and signed by all directors):

T2.18 RESOLUTION FOR JOINT VENTURE

CERTIFICATE OF AUTHORITY FOR JOINT VENTURES

This Returnable Schedule is to be completed by joint ventures.

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

PROJECT TITLE	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU NUMBER	**SCMU5-24/25-0037**

NAME OF FIRM	ADDRESS	DULY AUTHORISED SIGNATORY
Lead partner: ……		Signature……. Name …….. Designation……
……		Signature……. Name …….. Designation……
……		Signature……. Name …….. Designation……
……		Signature……. Name …….. Designation……

T2.19 SCHEDULE OF PROPOSED SUBCONTRACTORS

PROJECT TITLE	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU NUMBER	**SCMU5-24/25-0037**

We notify you that it is our intention to employ the following Subcontractors for work in this contract. The Subcontractors will all be CIDB registered and their CIDB Registration number shall be submitted below. This should also be declared on **SBD 6.1 form.**

If we are awarded a contract, we agree that this notification does not change the requirement for us to submit the names of proposed subcontractors in accordance with requirements in the contract for such appointments. If there are no such requirements in the contract, then your written acceptance of this list shall be binding between us.

We confirm that all subcontractors who are or to be contracted are registered on Central Supplier Database (CSD).

No.	Name and address of proposed Subcontractor	Nature and extent of work	Year completed	Value	Contact details
1					
2					
3					

4					
5					

The undersigned, who warrants that she/ he is duly authorised to do so on behalf of the enterprise, confirms that the content of this schedule that presented by the tenderer are within my personal knowledge and are to the best of my knowledge both true and correct

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.20 CAPACITY, QUALIFICATIONS AND EXPERIENCE OF KEY PERSONNEL

PROJECT TITLE	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU NUMBER	**SCMU5-24/25-0037**

The bidder must complete the table below to demonstrate the capacity of his personnel to execute and fulfil the Contract and to score the points for functionality scoring.

Attach the CV's and proof of registration of the Contract Manager, Site Agent and Primary Foreman in order to support Functionality Point Scoring (Refer to T1.3 Table A1). Also Refer to Clause 4.5 of Contract Data (C1.2) for minimum requirements of emplo21yees.

Quantity / No. of Resources	**Categories of Employee - Key Personnel (part of Business Enterprise)**	**Professional** **Registration No. (Where applicable)**	**Start Date of Employment**
	Contract Manager:* Name:		
	Site Agent:* Name:		
	Primary Foreman: Name:		
	Other Foreman: Name:		
	Quality Control & Safety Officer-Construction Supervisor: Name:		
	Artisans		
	Unskilled employees		N/A
	Others		N/A

The undersigned, who warrants that she/ he is duly authorised to do so on behalf of the enterprise, confirms that the content of this schedule that presented by the tenderer are within my personal knowledge and are to the best of my knowledge both true and correct.

* Personnel considered in Functionality Scoring.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____ _____

T2.21 RELEVANT PROJECT EXPERIENCE – COMPLETED PROJECTS

Tenderers must submit a max one-page description of **at least three** similar projects successfully completed.

The projects must correspond with the Project Reference forms which are part of the returnable documents.

Attach a Completion Certificate for each of the projects provided.

The description of each project must include the following information:

1. Essential introductory information:
   1.1. Name of project.
   1.2. Name of client.
   1.3. Contact details of client.
   1.4. Contact details (including telephone numbers and email addresses) of currently contactable references.
   1.5. The period during which the project was performed, and also, if this is different, the period during which the tenderer's team members were contracted.
   1.6. Cost of works and/or contract value (making it clear in broad terms what this cost/value purchased, and to what extent (if any) this cost/value was part of a larger project budget or programme budget).
   1.7. The value stated may only include the certified value on the payment certificates in favour of the tenderer.

NO.	NAME OF PROJECT.	NAME OF CLIENT.	CONTACT DETAILS OF CLIENT.	PROJECT VALUE	DATE COMPLETED
1					
2					
3					

If there are more projects, attach a separate page to address this issue (the above table is just for reference purposes).

The undersigned, who warrants that she/ he is duly authorised to do so on behalf of the enterprise, confirms that the content of this schedule that presented by the tenderer are within my personal knowledge and are to the best of my knowledge both true and correct.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.22 OTHER OFFERS SUBMITTED AT TIME OF THIS TENDER FOR WHICH RESULTS ARE PENDING

(Any other client's tender must also be included)

BID NO. / PROJECT NUMBER	PROJECT NAME	CLIENT NAME & CONTACT NO.	VALUE TENDERED IN RANDS	DATE SUBMITTED	CONTACT DETAILS (CLIENT)
1					
2					
3					
4					

If there are more projects, attach a separate page to address this issue (the above table is just for reference purposes)

The undersigned, who warrants that she/ he is duly authorised to do so on behalf of the enterprise, confirms that the content of this schedule that presented by the tenderer are within my personal knowledge and are to the best of my knowledge both true and correct.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.23 SCHEDULE OF TENDERER'S LITIGATION HISTORY

The tenderer shall list below details of any litigation with which the tenderer (including its directors, shareholders or other senior members in previous companies) has been involved with any organ of state or state department within the last ten years. The details must include the year, the litigating parties, the subject matter of the dispute, the value of any award or estimated award if the litigation is current and in whose favour the award, if any, was made.

NO.	NAME OF CLIENT.	OTHER LITIGATING PARTY	BRIEF DETAILS OF DISPUTE	PROJECT VALUE	DATE RESOLVED OR STATUS OF LITIGATION
1					
2					
3					
4					

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.24 PROJECT REFERENCE FORM: 1

Project title:	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
Project Number:	**SCMU5-24/25-0037**

NOTE: This returnable document must be completed by the person who was the Engineer/Project Manager on a project of similar value and complexity that was completed successfully by the tenderer.

I, _____ (name and surname) of _____ (company name) declare that I was the Project Manager on the following building construction project successfully executed by _____ (name of tenderer):

Project name: _____

Project location: _____

Construction period: _____ Completion date: _____

Contract value: _____

A. Please evaluate the performance of the Tenderer on the abovementioned project, on which you were the principal agent, by inserting "Yes" in the relevant box below:

Key Performance Indicators	Very Poor 1	Poor 2	Fair 3	Good 4	Excellent 5	Total
1. Project performance / time management / programming						
2. Quality of workmanship						
3. Resources: Personnel						
4. Resources: Plant						
5. Financial management / payment of subcontractors / cash flow, etc						
TOTAL						

B. Would you consider / recommend this tenderer again:

YES	NO

C. Any other comments:

_____

_____

D. My contact details are:

Telephone: _____ Cellphone: _____ Fax: _____

E-mail: _____

Thus signed at _____ on this _____ day of _____ 2024.

_____

Signature of principal agent

COMPANY STAMP

NOTE:

If reference cannot be verified due to the inability to get hold of the referee or failure on his/her part to respond to a written request to do so, that reference will not score any points. It is the responsibility of the tenderer to put referees who are reachable.

_____

Name of Tenderer

_____ _____

Signature of Tenderer Date

T2.25 PROJECT REFERENCE FORM: 2

Project title:	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
Project Number:	**SCMU5-24/25-0037**

NOTE: This returnable document must be completed by the person who was the Engineer/Project Manager on a project of similar value and complexity that was completed successfully by the tenderer.

I, _____ (name and surname) of _____ (company name) declare that I was the Project Manager on the following building construction project successfully executed by _____ (name of tenderer):

Project name: _____

Project location: _____

Construction period: _____ Completion date: _____

Contract value: _____

A. Please evaluate the performance of the Tenderer on the abovementioned project, on which you were the principal agent, by inserting "Yes" in the relevant box below:

Key Performance Indicators	Very Poor 1	Poor 2	Fair 3	Good 4	Excellent 5	Total
1. Project performance / time management / programming						
2. Quality of workmanship						
3. Resources: Personnel						
4. Resources: Plant						
5. Financial management / payment of subcontractors / cash flow, etc						
TOTAL						

B. Would you consider / recommend this tenderer again:

YES	NO

C. Any other comments:

_____

_____

D. My contact details are:

Telephone: _____ Cellphone: _____ Fax: _____

E-mail: _____

Thus signed at _____ on this _____ day of _____ 2024.

_____

Signature of principal agent

COMPANY STAMP

NOTE:

If reference cannot be verified due to the inability to get hold of the referee or failure on his/her part to respond to a written request to do so, that reference will not score any points. It is the responsibility of the tenderer to put referees who are reachable.

_____

Name of Tenderer

_____ _____

Signature of Tenderer Date

T2.26 PROJECT REFERENCE FORM: 3

Project title:	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
Project Number:	**SCMU5-24/25-0037**

NOTE: This returnable document must be completed by the person who was the Engineer/Project Manager on a project of similar value and complexity that was completed successfully by the tenderer.

I, _____ (name and surname) of _____ (company name) declare that I was the Project Manager on the following building construction project successfully executed by _____ (name of tenderer):

Project name: _____

Project location: _____

Construction period: _____ Completion date: _____

Contract value: _____

A. Please evaluate the performance of the Tenderer on the abovementioned project, on which you were the principal agent, by inserting "Yes" in the relevant box below:

Key Performance Indicators	Very Poor 1	Poor 2	Fair 3	Good 4	Excellent 5	Total
1. Project performance / time management / programming						
2. Quality of workmanship						
3. Resources: Personnel						
4. Resources: Plant						
5. Financial management / payment of subcontractors / cash flow, etc						
TOTAL						

B. Would you consider / recommend this tenderer again:

YES	NO

C. Any other comments:

_____

_____

D. My contact details are:

Telephone: _____ Cellphone: _____ Fax: _____

E-mail: _____

Thus signed at _____ on this _____ day of _____ 2024.

_____

Signature of principal agent

COMPANY STAMP

NOTE:

If reference cannot be verified due to the inability to get hold of the referee or failure on his/her part to respond to a written request to do so, that reference will not score any points. It is the responsibility of the tenderer to put referees who are reachable.

_____

Name of Tenderer

_____ _____

Signature of Tenderer Date

T2.27 BASELINE RISK ASSESSMENT

Project title:	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
Project Number:	**SCMU5-24/25-0037**
PLEASE NOTE THAT THIS IS A BASELINE RISK ASSESSMENT AND NOT A DETAILED RISK ASSESSMENT OF ALL ANTICIPATED ACTIVITIES ON SITE	

Activity	Risk to Safety	Risk to Health	Risk to Environmental	Risk to Public Safety	Control Measures
Brickwork	Physical injury, Fatality				PPE, Use of Scaffolding
Roofing	Physical injury, Fatality				PPE, Use of Scaffolding
Plastering	Skin irritation, temporary blindness	Long term breathing problems	Ground contamination	Dust inhalation	Use of PPE, guarding off site on work areas
Paintwork	Skin irritation, temporary blindness	Long term breathing problems	Ground contamination	Air pollution	Use of PPE, guarding off site on work areas
Construction activities / demolition	Temporary deafness	Permanent deafness	Noise pollution	Noise pollution	Guarding / barricading of site
Moving machines	Driven over by machines	Injury to workers	Fuel spillage	Driven over by machines	Signage and slow driving

You can list all activities on a separate page to address this issue (the above table is just for reference purposes).

T2.28 EASTERN CAPE INFRASTRUCTURE INPUT MATERIAL

PROJECT NAME	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT**
PROJECT DESCRIPTION (SCOPE)	**RENOVATIONS AND UPGRADING**
SCMU NUMBER	**SCMU5-24/25-0037**
CONTRACTOR NAME:	

1. Below is the list of building material which must be sourced from Eastern Cape based suppliers, manufacturers or accredited agents.
2. On monthly basis, the contractor will report the purchasing of any of this material.
3. The report will then be communicated to PT & OTP on quarterly basis or in whichever intervals, as prescribed by PT & OTP.

BUILDING MATERIAL LISTS– BUILDING RELATED STRUCTURES (NEW, REFURBISHMENTS & RENOVATIONS)

ITEM	MATERIAL (TYPE)	ESTIMATE AMOUNT (Rands)
1	Concrete	
2	Reinforcement	
3	Brickwork	
4	Brickwork Sundries	
5	Paints and coatings	
6	All pipes and fittings	
7	Plumbing Fittings	
8	Paving Blocks	
9	Gabions	
10	Stock fencing and poles	
11	Stormwater pipes	
12	Stormwater channels	
13	Water pipes	
14	Sewer Pipes	
	TOTAL	

A. CONFIRMATION

1. I……(***Contractor name***) acknowledge and confirm the above mentioned material will be sourced in the Eastern Cape Province, from Eastern Cape based material suppliers and manufacturers.
2. I confirm that on monthly basis I will produce a proof of purchase of this material used or to be used, either in the form of delivery notes, tax invoices or any formal document which verifies that the material or goods were sourced from an Eastern Cape based supplier or manufacturer.

Signature: _____ Date: _____

Representative of the Contractor (Name): _____ _____

T2.29 PERFORMANCE GUARANTEE

In the event of the Tenderer selecting a method of Security that requires the participation of a third party, e.g. bank or insurance company, the tenderer must compete the details of the proposed institution below.

The tenderer must also attach a letter of undertaking from the institution that indicated their intent to issue the Guarantee in the amount for which the Guarantee must be. The Guarantee must be exactly according to the wording in the Tender Document which is in accordance with the pro-forma of GCC 2015, Third edition.

Proposed Institution Details:

Company Name: _____

Contact Person: _____

Address: _____

_____

Telephone Number: _____

E-mail Address: _____

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

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.30 PROCESS DESIGNER

The tenderer must attach the Curriculum Vitae of the person designated as the Process Designer on the Contract and that is involved with the this Tender that is in his employment or from the organisation that is being subcontracted for the purposes of designs of processes and equipment, technical knowledge of process chemistry, equipment design etc.

The tenderer must also attach a **Memorandum of Understanding** where both parties have given their undertakings to have entered a business relationship to secure the knowledge and services required for process designs, technical input, design and manufacturing of specialist components and processors and overseeing of the commissioning, operation and maintenance of the new systems.

The CV's must contain the following:

1. Full names and ID No (attach certified copy of ID)
2. Contact details, including e-mail, tel no, cell, postal address.
3. Tertiary education (attach certified copies of Diploma or Degree)
4. Professional registration if any (Attach certifies certificate)
5. Employment history. Describe the relationship with the company of the tenderer, e.g. permanent employment and start date, subcontracting since start date etc.
6. List of some of the most important project involved with.
7. Description of the technical knowledge and contribution that the person has made to the company, e.g, process design of plants etc.
8. CV of the company which will render the services.
9. Qualifications towards process design knowledge.
10. Memorandum of Understanding signed by all JV members and the Process Designer

Insert the details of the person for which information is attached and for which points are claimed.

Name of Person	ID No	Education	Qualification / Registration

(The CV must be signed be the person and attested by a Commissioner of Oaths.)

Name of Tenderer: …….

Signature: …….

T2.31 SCHEDULE OF PLANT AND EQUIPMENT

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

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

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

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

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.32 WASTEWATER TREATMENT AND PLANT INFORMATION

The Tenderer must attach all the technical details of the following components to this page and complete the table below:

Item	Brief description and capacity where applicable
Blowers*	
Electrical Motors*	
Control Panel*	
Disinfection System*	
Flow Measurement System*	

*Please include data sheets and technical data on in a separately bound document.

Signed: _____ Date: _____

Name: _____ Position: _____

Enterprise Name: _____

T2.33 WATER PURIFICATION PLANT INFORMATION

The tenderer must submit a complete technical proposal for the Water Purification Plant proposed to be installed and that has been priced in the Pricing Schedules. The submission must be prepared by the person designated as the Process designer on the Contract with whom and Memorandum of Understanding has been signed and attached to the technical submission. The submission must be stapled or bound together and included with the tender. Provide a summary of the process or system proposed in the space below:

Brief Plant Description

If the technical aspects of the plant offered does not meet the specifications or in the opinion of the Engineer is not suitable or is of inadequate design. The Tenderer/Contractor will be instructed to modify or revise the design for the approval of the Engineer. This will be an express condition of Contract. Any additional costs for achieving approval of the plant and appurtenances will not be payable by the Employer and will be for the account of the Contractor.

Signed: _____ Date: _____

Name: _____ Position: _____

Enterprise Name: _____

T2.34 COMPANY PROFILE
(ATTACH HERE)

THE CONTRACT

PART C1 AGREEMENTS AND CONTRACT DATA

C1.1: FORM OF OFFER AND ACCEPTANCE

Annex C
(normative)

C1.1 FORM OF OFFER AND ACCEPTANCE

Project title	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU number	**SCMU5-25/24-0037**

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

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

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

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VALUE ADDED TAX IS
……
……
……Rand (in words);
R ……(in figures) (or other suitable wording)

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

Signature: _____

Name: _____

Capacity: _____

For the Tenderer:

Name of organization: _____

Address of organisation: _____

Witness Name: _____ _____

Date: _____

Signature: _____

ACCEPTANCE

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

Part C1 Agreements and contract data, (which includes this agreement)
Part C2 Pricing data
Part C3 Scope of work, Site Information and Drawings.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as listed in the returnable schedules as well as any changes to the terms of the offer agreed by the tenderer and the employer during this process of offer and acceptance, are contained in the schedule of deviations attached to and forming part of this form of offer and acceptance. No amendments to or deviations from said documents are valid unless contained in this schedule.
The tenderer shall within 3 weeks after receiving a completed copy of this agreement, including the schedule of deviations (if any), contact the employer's agent (whose details are given in the contract data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the conditions of contract identified in the contract data. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.
Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed original copy of this document, including the schedule of deviations (if any). Unless the tenderer (now contractor**)** within five working days of the date of such receipt notifies the employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the parties.[1]

Signature: _____

Name: _____

Capacity: _____

For the Employer:

Name of organization: _____

Address of organisation: _____

Witness Name: _____

Date: _____

Signature: _____

Schedule of Deviations

1 **Subject** _____

Details _____

_____

2 **Subject** _____

Details _____

_____

3 **Subject** _____

Details _____

_____

4 **Subject** _____

Details _____

_____ _____

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

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender/ quotation 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.

[1] *As an alternative, the following wording may be used:*

*Notwithstanding anything contained herein, this agreement comes into effect two working days after the submission by the employer of one fully completed original copy of this document including the schedule of deviations (if any), to a courier-to-counter delivery / counter-to-counter delivery / door-to counter delivery /door-to-door delivery /courier service (delete that which is not applicable), provided that the employer notifies the tenderer of the tracking number within 24 hours of such submission. Unless the tenderer (now contractor**)** within seven working days of the date of such submission 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*

PART C1.2: CONTRACT DATA

C1.2: CONTRACT DATA

Project title	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU number	**SCMU5-24/25-0037**

The General Conditions of Contract for Construction Works, Third Edition, (2015) published by the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House, 1685, are applicable to this contract and are obtainable from www.saice.org.za.

Copies of these conditions of contract may be obtained at the tenderer's own cost from the SAICE (Tel: 011-805 5947).

PART 1: CONTRACT SPECIFIC DATA PROVIDED BY THE EMPLOYER

CONDITIONS OF CONTRACT

The General Conditions of Contract for Construction Works, Third Edition (2015) (hereafter also referred to as GCC), published by the South African Institution of Civil Engineering is applicable to this contract.
The General Conditions of Contract are not bound into this document but are available at the Contractor's expense from the Secretary of the South African Institution of Civil Engineering, Private Bag X200, Halfway House, Midrand, 1685 or from www.saice.org.za.

The Contract Data (including variations and additions) shall amplify, modify or supersede, as the case may be, the GCC 2015 to the extent specified below, and shall take precedence and shall govern.
Each item of data given below is cross-referenced to the clause in the GCC 2015 to which it mainly applies.
The numbers below following the "C" refers to the corresponding Clause in the GCC 2015 or an additional Clause if added:

CONTRACT SPECIFIC DATA

The following contract specific data, referring to the General Conditions of Contract for Construction Works, Third Edition (2015) are applicable to this Contract:

Compulsory Data:

Clause	Description
1.1.1.5	The Commencement Date shall be the date on which the Contractor receives a copy of the signed Form of Offer and Acceptance and schedule of deviations if applicable or on any other date thereafter to which the Employer may agree to.
1.1.1.13	The Defects Liability Period is **12 months**, measured from the date of the Certificate of Completion.
1.1.1.14	The time for achieving Practical Completion, from the Commencement Date is 18 months. The period as stated in 5.3.2, and the 7 days referred to in 5.3.3, are included in the above time for achieving Practical Completion. The Operation and Maintenance Period is 24 months, which follows directly after Practical Completion. The special non-working dates are stated in 5.8.1 are excluded from the above time for achieving Practical Completion.
1.1.1.15	Name of Employer is: **EASTERN CAPE DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE (DPW).**
1.1.1.16	The Employer's Agent is a director of the appointed firm CSE Consulting (Pty) Ltd. The project Manager will be Carifro Consulting Engineers.

Clause	Description
1.1.1.17	Add the following to the clause: Any reference to the term “Engineer’s Representative” in this Contract shall mean “Employer’s Agent’s Representative” and vice versa.
1.1.1.26	The pricing strategy is: **Re-measurement Contract**.
1.2.1.2	**The Employer’s address for receipt of communications and notices is:** Eastern Cape Department of Public Works and Infrastructure Qhasana Building Independence Avenue Bhisho 5605 Contact Person: Mr M Ngamlana **The Employer’s Agent for receipt of communications and notices is:** Carifro Consulting Engineers 6 Belgrave Road Belgravia East London 5201 Contact Person: Mr Likhaya Nkonki CSE Consulting (Pty) Ltd 7B Derby Road, First Floor Berea East London 5241 Contact Person: Mr JPC van Wyk
3.2.3	The Employer’s Agent shall obtain the specific approval of the Employer before executing any of his functions or duties according to the following Clauses of the General Conditions of Contract: **2. Existing Clauses:** 5.7.2 Work at night as well as by day. 5.8 Non-working times. 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 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	Safe Working Practice Occupational Health and Safety Group have been appointed as Client Agents on this contract in terms of the Construction Regulations, 2014, as promulgated in terms of the Occupational Health and Safety Act, 1993.

Clause	Description
4.3.3	**Add the following** new clause: "Contractor's Designer: The Contractor and his designer(s) shall accept full responsibility and liability for compliance with the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and the Construction Regulations, 2014, for the design of the Temporary Works and those parts of the Permanent Works which the Contractor is responsible to design in terms of the Contract."
4.4	Clause 4.4 Subcontracting: "**Clause 4.4.8 SME's"** Add the follow Clause It is part of the scope of this Contract that the Employer will call for tenders and appointment of Small and Medium-sized Enterprises (SME's) to carry out the work for which provisional sums have been allowed in the Schedule of Quantities. These SME's will be Domestic subcontractors to the Contractor and the cover of his Insurance Policies must include to cover these enterprises. The prices of the Contractor is deemed include for all risks, profit, training, oversight, co-ordination and management of the SME's. The Contractor must deduct 10% retention monies from the payments to the SME's until practical completion of their work has been to the specifications and approval of the Engineer, whichever is last. "
4.5	**Minimum Requirements of Employees:** **Add the following to Subclause to Clause 4.11 – "Clause 4.11.3"** **Employees:** The representatives or personnel of any subcontractors of the Contractor required to carry out any work required in terms of this contract, part time or full time, will be deemed to be an employee of the Contractor. These include persons that fulfill functions on site or elsewhere, directly involved with construction or elsewhere with design of components forming part of the scope of works. **Specialized technical nature of the Works:** Due to the specialized nature of the works to be taken in terms of construction, management and design and supply the following conditions will apply: The contractor must submit the CV's that state, inter alia the qualifications, experience, and details of successfully completed project where the employee under question has performed the tasks or duties that he must execute for this Contract. This information must be submitted before site handover for approval by the Engineer. On request by the Engineer, the Contactor must present the employees at the office of the Engineer for interviews to ascertain their competence and suitability.

Clause	Description
	Minimum requirements of employees: **Construction Manager (Site Agent):** The site agent must have at least a NQF 5 qualification directly relevant to the construction industry and a at least 7 years of experience in civil engineering construction of which at least 2 years in the position as Site Agent. The Site Agent must have experience in civil engineering construction that covers reservoirs or water treatment plants or wastewater treatment plants, retaining structures, or installations of services like sewers or water pipelines, or construction of pumping stations or other similar. **Contract Manager:** The Contracts Manager must have at least and NQF 5 qualification directly relevant to the construction industry and at least 10 years of experience in civil contracting of which at least 3 years in the position as Contract Manager. The Contract Manager must have experience in civil engineering construction that covers reservoirs or water treatment plants or wastewater treatment plants, retaining structures, or installations of services like sewers or water pipelines, or construction of pumping stations or other similar. The Contracts manager must also have experience as representative of the principal contractor on a project where the mechanical and electrical installations subcontractors was under his control. This includes water treatment plants, wastewater treatment plants or industrial processing plants. **Specialist Mechanical and Process Designer:** This Contractor must have in his employ experienced and qualified person(s) that has the theoretical contextual knowledge and experience to design biochemical processes for wastewater treatment and water purification plants. These persons must have at least a NQF 7 relevant qualification, and at least 15 years of experience and proof of the designs of plants that have been operational for at least 5 years. The Engineer may request to inspect these plants prior to granting approval for the plants and equipment that the Contractor proposes to install. The Contractor must ensure, prior to submission of his tender, that the owners of the plants consent to such inspections. The Process designer must liaise with the Engineer to seek approval of designs. He/ they must attend site meeting and inspections when required to do so. He/they must also be on site during commissioning of the systems included in the Works. He must also control and be involved in the monitoring of the systems after commissioning to ensure compliance, fault tracing when systems or equipment fails and modification to the system should it be required. He must also be experienced with the design and commissioning of the mechanical installations like pumps and blowers.

Clause	Description
	Site Agent (Electrical): This employee must permanently present during the installation and commissioning of electrical systems and fire detections systems. He must be a Registered Installation Electrician. If the Engineer finds that any of the above Employees are lacking in experience or knowledge qualification or relevant registration, the Engineer may instruct the Contractor to remove the employee from the Works (site or elsewhere), who must then be replaced by an employee that meets the requirements. **Tradesman:** The Contractor must Employ the relevant registered tradesman to oversee and carry out the activities being undertaken, e.g. Pipe Layer, Registered Plumber, etc. During the installation testing and commissioning of the fire related installations the Contractor must have in his permanent employ a registered SAQCC Fire D&GS Gas Suppression Serviceman/commissioner. **Failure to Comply:** The site will not be handed over to the Contractor if the approval from the Engineer has not been obtained for the employees he proposes to use or the employees do not meet all the requirements. If the Contractor fails to submit the required information or fail to employ the required employees that meet the various requirements, the Contractor will be in breach of the Contract and the Employer may terminate the Contract in terms of Clause 9.2 and subclauses. Alternatively, if the Contractor fail to employ suitable employees or replace unsuitable employees, within 14 days, the Engineer may employ suitable persons on behalf of the Contractor and deduct to cost of the employment form the payment certificate of the Contractor. The Contractor will be required to efficiently utilize these persons in their company as employees. The Engineer and the Employer stands indemnified of any consequences of the employment of such employees."
5.3.1	The documentation required before Commencement of the Works are: • Health and Safety Plan (Refer to Clause 4.3) • Initial Programme (Refer to Clause 5.6) • Security (Refer to Clause 6.2) Insurance (Refer to Clause 8.6)
5.3.2	The Contractor is required, **within 14 days of the Commencement Date**, to submit the documents listed below to the Employer's Agent for his approval. **Health and Safety Plan** A health and safety plan in terms of Clause 7(1) of the Construction Regulations (February 2014). **Initial Programme** An Initial Programme of work in terms of Clause 5.6. **Security** A guarantee from an Insurance Company to be jointly and severally bound with the Contractor for an amount equal to **five percent (5%)** of the Contract Price. The wording of the Guarantee shall be identical to the pro forma included in this document.

Clause	Description
	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. a) Proof of registration with the Department of Labor as an employer, in terms of the Compensation for Occupational Injuries and Diseases Act 1993, as amended b) Common Law Liability Insurance for the duration of the Contract Period and with a minimum Limit of Indemnity of not less than R5 000 000 for any one accident but the Contractor must assess the risk and provide for additional cover at his own cost; c) Insurance on an All Risks basis for construction plant, equipment and other things (except those intended to incorporation into the works) brought onto the site to the full value of such construction plant, equipment and other things; d) Motor Vehicle Liability Insurance, comprising a minimum of Balance of Third Party motor risks, including Passenger Liability, subject to a minimum limit of R2,5 million but the Contractor must assess the risk and provide for additional cover at his own cost. e) 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. f) Imported equipment or component parts or materials to be supplied in terms of this Contract which require any process of assembly or finishing in South Africa prior to delivery to the site are to be insured by the Contractor up to the commencement of transit to site of the assembled or finished equipment, component parts or materials, unless special arrangements are made with the Employer. g) These insurances shall be maintained in force for the duration of the Contract, including any Defects Liability Period and O & M period and in respect of Sub-Contractors, the Contractor shall be deemed to have complied with the provisions of the requirements relating to insurance by ensuring that the Sub-Contractors have effected such insurance.
5.4.2	Access to and possession of the Site shall not be exclusive to the Contractor. 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. The Contractor shall also provide at his own cost any additional facilities outside the Site required by him for the purposes of the Works.
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 Sectorial Determination applicable to a 5 (five) day week (Monday to Friday) from 07:00 to 17:00. Non-working days are Sundays and special non-working days are public holidays, election day of the local government elections and national elections (when applicable) and the official builder's holidays as defined by SAFCEC.

<table>
<tr><th>Clause</th><th>Description</th></tr>
<tr><td>C5.12.2.2</td><td>
Abnormal Climatic Conditions (Rain Delays) –
Add to following as Sub-clause 5.12.2.3:

“Rainfall and the consequences thereof will not be considered as abnormal climatic conditions. Instead, the extension of time for completion for rainfall will be calculated as provided for below. The calculated extension is deemed to compensate for disruption and consequential wet conditions that effects progress of the Works.

The extension granted will be calculated according to the following formula and data in the table:

<table>
<tr><th>Month</th><th>Nn (Days)</th><th>Rn (mm)</th></tr>
<tr><td>January</td><td>3.4</td><td>108.7</td></tr>
<tr><td>February</td><td>3.3</td><td>110.1</td></tr>
<tr><td>March</td><td>3.5</td><td>125.3</td></tr>
<tr><td>April</td><td>1.8</td><td>70.3</td></tr>
<tr><td>May</td><td>1.2</td><td>46.8</td></tr>
<tr><td>June</td><td>0.6</td><td>28.6</td></tr>
<tr><td>July</td><td>0.8</td><td>29.8</td></tr>
<tr><td>August</td><td>1</td><td>37.2</td></tr>
<tr><td>September</td><td>2.3</td><td>79.4</td></tr>
<tr><td>October</td><td>2.9</td><td>108.2</td></tr>
<tr><td>November</td><td>3.2</td><td>112.2</td></tr>
<tr><td>December</td><td>3.3</td><td>109.4</td></tr>
<tr><td colspan="2">TOTALS</td><td>965.9</td></tr>
</table>

$$V = (Nw - Nn) + \frac{(Rw - Rn)}{x}$$
</td></tr>
</table>

Clause	Description
	If any value of V is negative and its absolute value exceeds Nn, then V shall be taken as equal to minus Nn. The delay for a part of a month shall be calculated by substituting pro rate values for the variables in the equation. The symbols shall have the following meanings: V = Delay due to rain in calendar days in respect of the calendar month under consideration. Nw = Actual number of days during the calendar month on which a rainfall of 10 mm or more per day has been recorded. Rw = Actual rainfall in mm for the calendar month under consideration. Nn = Average number of days in the relevant calendar month (as derived from existing rainfall records provided in the project specifications) on which a rainfall of 10 mm or more per day has been recorded. Rn = Average rainfall in mm for the calendar month, as derived from the rainfall records supplied in the project specifications. x = 10mm The total delay that will be considered for the determination of the total extension of time for the contract shall be the algebraic sum of the monthly totals for the period under consideration. If the grand total is negative, the time for completion shall not be reduced on account of abnormal rainfall. The total extension of time for any calendar month shall not exceed (Nc - Nn) calendar days, where Nc = number of working days in the month under consideration. The factor (Nw - Nn) shall be considered to represent a fair allowance for variations from the average number of days during which rainfall equals or exceeds 10 mm per day. The factor (Rw - Rn) ÷ x shall be considered to represent a fair allowance for variations from the average for the number of days during which rainfall does not equal or exceed 10mm per day, but when wet conditions prevent or disrupt work. Accurate rain gauging's shall be taken at a suitable point on the site daily at 08:00 unless otherwise agreed to by the Engineer, and the contractor shall, at his own expense, take all necessary precautions to ensure that the rain gauges cannot be interfered with by unauthorized persons. Should any doubts arise about the accuracy of rainfall measurements, the Engineer may at his discretion use rainfall records of the South African Weather Bureau taken at the station nearest to the site." Should any extension of time granted cause the time for completion to overlap with the special non-working days during the December and January builder holiday as defined in the Appendix that was not part of the contract period as at commencement, no additional time related General Items will be paid for this period, except proven costs involved for the maintenance of Insurances required in terms of the contract. The Preliminary and General allowances tendered will be deemed to allow for costs for the period of inactivity during the builder's holiday. Any other delays that fall on the critical path concurrent with the days calculated from the above will not be considered a delay."

Clause	Description
5.12.2.4	Replace Clause 5.12.2.4 entirely with the following: "Any disruption which is entirely beyond the control of the Contractor except for unrest, disruptions, strikes, lockouts etc. that originate from the staff or labor of the contractor or his subcontractors."
5.12.3	Replace Clause 5.12.3 entirely with the following: "If an extension of time is granted, the Contractor shall be paid additional time-related General Items in respect of plant, labor and supervision, including for special non- working days, if applicable and according to actual cost incurred where diminished resources and head office support was required. The Contractor must provide substantiating documentation on request, which may include pay slips, invoices etc."
5.12.5	Add the following to Clause 5.12 5.12.5 Critical Path Provision 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 six normal working days, will be taken in account for the extension of time.
5.13.1	The penalties for failing to complete the Works shall be as follows: The penalty for failing to complete the works will be calculated as R 2.25 per R100.00 of the Contract awarded amount.
5.16.3	The latent defect period is 10 years.
5.14.5.5	Delete Clause 5.14.5.5 and replace with: "Insurance of the works shall continue until the expiration of the Defects Liability Period, in terms of the new Clause 8.6 contained in this Contract Data. Insurance must also be carried for the Operation and Maintenance period for oversight over the nominated subcontractor""
6.2.1	Replace the wording "as selected" in Clause 6.2.1 with "as stated." The security to be provided by the Contractor for each work assignment shall be: a) a performance guarantee of **five percent (5%)** of the Contract Sum, plus b) retention money amounting to **five per cent (5%)** of the Contract Price of which 50% will be returned upon Completion and the balance after expiry of the Defects Period of 12 months or Final Completion of the Works, whichever occur first. c) plus retention monies on amounts relating to work done during the Operation & Maintenance period of 10%, which will be reduced by 50% of the amount held in retention for these amounts at the anniversary of the date of Practical Completion. Retention will remain at 10% for the O & M period for the following year until reduction at anniversary again. There is no limit of retention money. Retention monies due shall be subjected to Clauses 6.10.1.3 and 6.10.3. The performance guarantee shall be from an approved Insurance Company or Financial Institution to be jointly and severally bound with the Contractor, in accordance with the provisions of the Form of Guarantee. The wording of the performance guarantee shall be identical to the pro-forma provided under Clause C1.3: Form of Guarantee of the Contract Data."

Clause	Description
6.2.2	Replace the entire contents of Clause 6.2.2 with the following: "If the Contractor fails in his obligations to provide the stated security within the period stated in Clause 5.3.2, or if the performance guarantee shall differ from the pro-forma provided under Clause C1.3: Form of Guarantee of the Contract Data, the Employer may terminate the Contract in terms of Clause 9.2."
6.2.3	Replace the entire contents of Clause 6.2.3 with the following: "The Contractor shall ensure that the performance guarantee remains valid and enforceable until the issue of the Certificate of Completion."
6.8.2	Contract Price Adjustment Factor: *If the value of payment certificates is to be adjusted by a Contract Price Adjustment Factor then:* The value of the certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule with the following values: The values of the coefficients are: a = *0.2 Labor* b = *0.1 Contractor's equipment* c = *0.4 Material* d = *0.3 Fuel* *Please note that the total of all the coefficients must equal 1.0.* The indices for "L", "P", "M" and "F" are the following as published by Statistics South Africa: 1. "L" is the "Labor Index" and shall be the Stats SA Consumer Price Index PO141, Table E, All items (CPI Headline) 2. "P" is the "Contractor's Equipment Index" and shall be the Stats SA Construction Material Price Indices PO151.1, Table 4, Plant and Equipment. 3. "M" is the "Materials Index" and shall be the Stats SA Construction Material Price Indices PO151.1, Table 6, Civil Engineering Material, Total. 4. "F" is the "Fuel Index" and shall be the Stats SA Producer Price Index PO142.1 Table 1, Diesel. The base month is the month prior to the tender closing date.
6.10.1.5	The percentage advance on materials on site not yet built into the Permanent Works is 80%. No materials stored off site will be applicable.
6.10.3	Replace the entire contents of Clause 6.10.3 with the following: "Payment of the amounts referred to in Clauses 6.10.1.1, 6.10.1.2, 6.10.1.3 and 6.10.1.4 shall be subject to a retention by the Employer of an amount (called the "retention money"), being the percentage retention stated in the Contract Data, of the said amounts due to the Contractor." The percentage of performance guarantee and retention money will be as stated in the Contract Data. There is no limit on retention money.

Clause	Description
8.3	Add the following to Clause 8.3: "The late delivery or availability of materials to be built into the works will not be considered an accepted risk. The Employer may grant an extension of time if delay is cause by this , but without an obligation to pay additional Costs or scheduled preliminary and general items."
8.4.1.9	Add the following Clause to 8.4.1 as Clause 8.4.1.9: "Any loss or consequences related to the present Covd-19 pandemic and associated government regulations or change thereof during the contract."
8.6.1.1.2	The value of Plant and materials supplied by the Employer to be included in the insurance sum is not required.
8.6.1.3	The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is minimum R 2,000,000 but contractor to assess his risk and provide his cover for shortfalls.
8.6.1.2	If special risk insurance from SASRIA is not required, then: A coupon Policy for Special Risks Insurance issued by SASRIA is required.
8.6.1.3	The minimum limit of indemnity for liability insurance is R 100 000 000 but at the discretion of the Contractor to assess and increase.
8.6.1.4	Ground Support insurance required to a minimum of R 5 000 000 but the Contractor must assess and provide for additional cover at his cost if he so requires.
8.6.1.5	Furthermore, the insurance covers affected by the Contractor must also cover the O & M period.
8.6 8.6.1	Notwithstanding the provisions contained in the General Conditions of Contract regarding; Contractor in any way whatsoever, and on the understanding that the Contractor is not relieved from his obligations towards the Employer regarding the provision (by the Contractor) of any other insurances, the Contractor shall effect and maintain for the duration of the Contract until the expiry of the Defects Liability Period, including initial transit to the Contract site Contract Works Insurance (including SASRIA Insurance) and Public Liability (Third Party) Insurance both in the joint names of the Employer and the Contractor (including all Sub-Contractors whether nominated or otherwise), and those on whose behalf the Employer has authority to arrange insurance. The Contractor shall pay for all deductibles incurred as a result of claims made under the Contact.

Clause	Description
9.2	**Termination by The Employer** Add the following Subclause to Clause 9.2: "Clause 9.2.1.3.8 : Failed or continue or repeatedly fail to employ the persons or employees required in terms of Clause 4.11.3. "
10.3.2	Delete Clause 10.3.2 and add the following; 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 two (2).
10.7.1	The determination of disputes which are unresolved in terms of Clause 10.5.3 shall be by arbitration.
10.11	Add the following additional clause: "**Details to be confidential"** The Contractor shall treat the details of the Works comprised in this Contract as private and confidential (save in so far as may be necessary for the purposes hereof) and shall not publish or disclose the same or any particulars thereof in any trade or technical paper elsewhere without the prior written consent of the Employer's Agent."

PART 2: DATA TO BE PROVIDED BY THE CONTRACTOR

Clause	Description
1.1.1.9	The legal name of the Contractor is: …… ……
1.2.1.2	The Physical address of the Contractor is: …… …… …… The Postal address of the Contractor is: …… …… …… The contact numbers of the Contractor are: Telephone: …… Fax: …… The E-Mail address of the Contractor is: ……

<table>
<tr><td>6.2.1</td><td>The security to be provided by the Contractor shall be one of the following:

<table>
<tr><th>Type of security</th><th>Contractor's choice
(Indicate "Yes" or "No")</th></tr>
<tr><td>Cash deposit of 5% of the Contract Sum.</td><td></td></tr>
<tr><td>Fixed Performance Guarantee of 5% of the Contract Sum.</td><td></td></tr>
<tr><td>Retention of 5% of the value of the Works.</td><td>Not permitted</td></tr>
<tr><td>Cash deposit of ……..*% of the Contract Sum plus fixed performance guarantee of …….*% of the value of the Works.</td><td></td></tr>
<tr><td>Fixed Performance guarantee of ……..*% of the Contract Sum plus retention of ……..*% of the value of the Works.</td><td>Not permitted</td></tr>
</table>

The values above calculated on the Contract Sum that includes 15% VAT.
*Contractor to complete the percentages, subject to the total being equal or more than 5%.
The total value of the Surety will be reduced by half of the Guarantee Sum upon issue of Practical Completion Certificate.
"Retention monies, if any, that are held shall not exceed 5% of any amount due to a contractor. For work related to the O&M period the percentage will be 10%.</td></tr>
<tr><td>6.5.1.2.3</td><td>The percentage allowance on the net cost of materials used in the completed work is as indicated in the Schedule of Quantities.

The percentage allowance on the gross remuneration of the workmen and foremen actually engaged is as indicated in the Schedule of Quantities. Dayworks rates that have been priced will override.

The percentage allowance on the cost of plant is as indicated in the Schedule of Quantities, subject to the stipulations of Clause 6.5.1.3.</td></tr>
<tr><td>6.8.3</td><td>The variation in cost of special materials is not permitted.</td></tr>
</table>

C1.3 CIDB ADJUDICATOR'S AGREEMENT

This agreement is made on the . . . . . day of . . . . . between:. . . . . .

Witness		Witness:		Witness:	
Name:		Name		Name:	
Address:		Address:		Address:	
Date:		Date:		Date:	

Contract Data

1	The Adjudicator shall be paid at the hourly rate of R. . . . . in respect of all time spent upon, or in connection with, the adjudication including time spent travelling.
2	The Adjudicator shall be reimbursed in respect of all disbursements properly made including, but not restricted to: (a) Printing, reproduction and purchase of documents, drawings, maps, records and photographs. (b) Telegrams, telex, faxes, and telephone calls. € Postage and similar delivery charges. (d) Travelling, hotel expenses and other similar disbursements. € Room charges. (f) Charges for legal or technical advice obtained in accordance with the Procedure.
3	The Adjudicator shall be paid an appointment fee of R . . . . . This fee shall become payable in equal amounts by each Party within ….. days of the appointment of the Adjudicator, subject to an Invoice being provided. This fee will be deducted from the final statement of any sums which shall become payable under item 1 and/or item 2 of the Contract Data. If the final statement is less than the appointment fee the balance shall be refunded to the Parties.
4	The Adjudicator is/is not* currently registered for VAT.
5	Where the Adjudicator is registered for VAT it shall be charged additionally in accordance with the rates current at the date of invoice.
6	All payments, other than the appointment fee (item 3) shall become due in 30 days after receipt of invoice, thereafter interest shall be payable at 5% per annum above the Reserve Bank base rate for every day the amount remains outstanding.

* Delete as necessary

C1.4 PERFORMANCE GUARANTEE

Project title	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU number	**SCMU5-24/25-0037**

PRO FORMA (Compulsory)

PERFORMANCE GUARANTEE

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

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means: ……

Physical address: ……

"Employer" means: ……

"Contractor" means: ……..

"Employer's Agent" means: ……

"Works" means: ……..

"Site" means: ……....

"Contract" means: The Agreement made in terms of the Form of Offer and Acceptance and such amendments or additions to the Contract as may be agreed in writing between the parties.

"Contract Sum" means: The accepted amount inclusive of tax of R ……

Amount in words: ……..

"Guaranteed Sum" means: The maximum aggregate amount of R ……....

Amount in words: ……..

Type of Performance Guarantee: Fixed

"Expiry Date" means: Date of Issue of Final Approval Certificate in terms of Clause 15.6

CONTRACT DETAILS

Employer's Agent issues: Interim Payment Certificates, Final Payment Certificate and the Certificate of Completion of the Works, Final Approval Certificate as defined in the Contract.

VARIABLE PERFORMANCE GUARANTEE (Not Applicable to this contract)

1.1 Where a Variable Performance Guarantee has been selected, the Guarantor's liability shall be limited during the following periods to diminishing amounts of the Guaranteed Sum as follows:

1.1.1 From and including the date of signing the Performance Guarantee up to and including the date of the interim payment certificate certifying, for the first time, more than 50% of the Contract Sum: R……

(Amount in words ……..)

1.1.2 From the day following the date of the said interim payment certificate up to and including the Expiry Date, or the date of issue by the Employer's Agent of the Certificate of Completion of the Works, whichever occurs first:

R…….

(Amount in words ……)

1.2 The Employer's Agent and/or the Employer shall advise the Guarantor in writing of the date on which the interim payment certificate certifying, for the first time, more than 50% of the Contract Sum, has been issued and the date on which the Certificate of Completion of the Works has been issued.

2. FIXED PERFORMANCE GUARANTEE

2.1 Where a Fixed Performance Guarantee has been selected, the Guarantor's liability shall be limited to the amount of the Guaranteed Sum.

2.2 The Guaranteed Sum will be reduced by 50% from the date of issue of Practical Completion Certificate. The Employers Agent and/or the Employer shall advise the Guarantor in writing of the date on which the Practical Completion Certificate has been issued.

2.3 The Guarantor's period of liability shall be from and including the date on which the Performance Guarantee is signed, up to and including the Expiry Date, or the date of issue by the Employer's Agent of the issue of the Final Approval Certificate in terms of Clause 5.15 of the Contract, or the date of payment in full of the Guaranteed Sum, or the reduced value as stated in Paragraph 2.2 above if the Practical Completion Certificate has been issued, whichever occurs first.

2.4 The Employer's Agent and/or the Employer shall advise the Guarantor in writing of the date on which the Final Approval Certificate has been issued.

3. CONDITIONS APPLICABLE TO VARIABLE AND FIXED PERFORMANCE GUARANTEES

3.1.1 The Guarantor hereby acknowledges that:

Any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship.

3.1.2 Its obligation under this Performance Guarantee is restricted to the payment of money.

3.2 Subject to the Guarantor's maximum liability referred to in 1.1 or 2.1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 3.2.1 to 3.2.3:

3.2.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Employer's Agent in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 3.2.2;

3.2.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 3.2.1 and the sum certified has still not been paid;

3.2.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 3.2.

3.3 Subject to the Guarantor's maximum liability referred to in 1.1 or 2.1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:

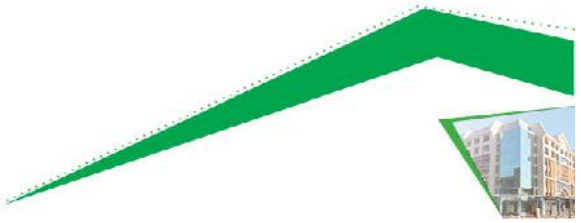
3.3.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 3.3; or

3.3.2 a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 3.3; and

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

3.4 It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 3.2 and 3.3 shall not exceed the Guarantor's maximum liability in terms of 1.1 or 2.1.

3.5 Where the Guarantor has made payment in terms of 3.3, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.



3.6 Payment by the Guarantor in terms of 3.2 or 3.3 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

3.7 Payment by the Guarantor in terms of 3.3 will only be made against the return of the original Performance Guarantee by the Employer.

3.8 The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may consider fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.

3.9 The Guarantor chooses the physical address as stated above for the service of all notices for all purposes in connection herewith.

3.10 This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 1.1.2 or 2.3, where after no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired.

3.11 This Performance Guarantee, with the required demand notices in terms of 3.2 or 3.3, shall be regarded as a liquid document for the purposes of obtaining a court order.

3.12 Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrates' Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at: ……

Date: ……

Guarantor's signatory (1): ……

Capacity: ……

Guarantor's signatory (2): ……

Capacity: ……

Witness signatory (1): ……

Witness signatory (2): ……

PART C2 PRICING DATA

PART C2.1: PRICING INSTRUCTIONS

C2.1 PRICING INSTRUCTIONS

Project title	**TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS**
SCMU number	**SCMU5-24/25-0037**

PREAMBLE TO SCHEDULE OF QUANTITIES:

1. The pages in the schedule of quantities are numbered continuously. The tenderer must check the pages before he submits his tender, and if any pages are missing, duplicated, or unclear or contain obvious errors, the engineer should be notified to have these errors rectified. Please note that the Schedule of Quantities consist of Schedules 1 to 5.

2. The Project Specifications, the General Conditions of Contract, the Contract Data, the special conditions of contract if any, the drawings, site information and notice(s) to the tenderers are to be read in conjunction with the schedule of quantities.

3. Descriptions in the schedule of quantities are abbreviated and the schedule has been drawn up generally in accordance with the 1990 issue of Civil Engineering Quantities. Should any requirements of the measurement and payment Clause of the applicable standardised specification, or the project specification, or the project or standard specification or section conflict with the terms of the schedule, or, when relevant, the said Civil Engineering Quantities, the requirement of the standardised project, or project specification section, as applicable shall prevail.

   The measurement and payment Clauses of each specification, read together with the relevant Clauses of the project specification, set out what ancillary or associated activities are included in the rate for the operations specified.

4. Unless otherwise stated, items are measured nett in accordance with the drawings and specifications, and no allowance has been made for waste. All quantities are provisional, and payment will be made after the actual quantities have been measured on site after completion of the works and agreed to.

5. The prices and rates to be inserted in the schedule of quantities are to be the full inclusive prices to the employer for the work described under each item. Such prices shall cover all costs and expenses that may be required in and for the construction of the work described, and shall cover the cost of all general risks, liability, and obligations set forth or implied in the documents on which the bid is based. These prices and rates must be nett and not include value added tax. Value added tax must be added as a separate item on the summary page.

6. A price or rate is to be entered against each item in the schedule of quantities, whether the quantities are stated or not. An item against which no price is entered will be considered to have a price or rate of R0-00. It will be accepted that items against which no price has been inserted are covered by other prices or rates in the schedule.
7. Arithmetical errors will be corrected in accordance with the Standard Conditions of Tender. (The tender price remains fixed and rates and prices are adjusted and balanced.)
8. The contractor must not order the quantities of materials stated in the schedule of quantities until he has confirmed from the construction drawings or measurement on site and with the engineer that such quantities are in fact the correct quantities.

9. Reference to Clauses in this and other documents and drawings are generally abbreviated as follow:

Document/ Source	**Abbreviation**
PS….	Project Specification
BS…..	Particular Specification
SABS/ SANS	SABS 1200 standardized specification
E765 -…..	Drawings
LI	Labour Intensive

10. An ordinary number in the reference column refers to the standardized specifications. A letter followed by a number in the reference column refers to an applicable Clause of the project specifications or particular specifications.
The absence of a reference must not be construed that no specification is applicable. The tenderer must ensure that all the requirements of the project specifications and standard specifications are covered by the items and rates tendered. If he is of the opinion that a specific Item needs to be added, he must insert such an Item with a price or a rate as applicable. Therefore, the items in the schedule of quantities are considered to cover the project specifications entirely.

11. The attention of tenderers is drawn to the fact that the sections in the Schedule of Quantities are divided into four schedules as described in the Project Specifications. The sections are distinguished as follows Tenderers must transfer the totals of sections to the correct position in the Summary Page of the Schedule of Quantities.

Prefix	**Portion of Work**
Schedule 1	Preliminary Section
Schedule 2	Civil Works
Schedule 3	Specialist M&E Installations
Schedule 4	Electrical and Controls
Schedule 5	Fire Detection and Fire Extinguishing

12. The tenderer must price and extend each item and total each section in the schedule of quantities in **BLACK INK.**

C2.2 SCHEDULES OF QUANTITIES

REFER TO ANNEXURE A

C2.3 PRICING SUMMARY

C2.3.1 SCHEDULE OF QUANTITIES:
TAFALOFEE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

SCHEDULE 1 : PRELIMINARY SECTIONS

Amounts in this Schedule of Quantities are to be transferred to Final Summary C2.3.6

Section	Name	Amount
1	Preliminary and General	
2	Occupational Health and Safety Regulations	
3	Daywork Schedule	
4	SMME Packages	
	Total Schedule 1	**R**
ABOVE TOTAL TO BE CARRIED FORWARD TO C2.3.6: FINAL SUMMARY		

C2.3.2 SCHEDULE OF QUANTITIES:
TAFALOFEE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

SCHEDULE 2 : CIVIL WORKS
Amounts in this Schedule of Quantities are to be transferred to Final Summary C2.3.6

Section	Name	Amount
1	Site Clearance	
2	Earthworks	
3	Earthworks (Pipe Trenches) (Road Upgrade)	
4	Small Earth Dams	
5	Gabions and Pitching	
6	Concrete (Structural)	
7	Medium Pressure Pipelines	
8	Bedding (Pipes)	
9	Cable Ducts	
10	Sewers	
11	Stormwater Drainage	
12	Fencing	
13	Segmented Paving	
	Total Schedule 2	**R**

ABOVE TOTAL TO BE CARRIED FORWARD TO C2.3.6: FINAL SUMMARY

C2.3.3 SCHEDULE OF QUANTITIES:
TAFALOFEE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

SCHEDULE 3 : SPECIALIST MECHANICAL AND ELECTRICAL INSTALLATIONS

Amounts in this Schedule of Quantities are to be transferred to Final Summary C2.3.6

Section	Name	Amount
1	Wastewater Treatment	
2	Water Purification Plant	
3	Operation and Maintenance	
	Total Schedule 3	**R**

ABOVE TOTAL TO BE CARRIED FORWARD TO C2.3.6: FINAL SUMMARY

C2.3.4 SCHEDULE OF QUANTITIES:
TAFALOFEE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

SCHEDULE 4 : ELECTRICAL AND CONTROLS

Amounts in this Schedule of Quantities are to be transferred to Final Summary C2.3.6

Section	Name	Amount
1	Preliminaries and General	
2	Field Instrumentation	
3	Motor Controls and Communication	
4	Cables, Trenches and Cable Trays	
5	Luminaires, Wiring, Conduits and Accessories	
6	Lightnin Protection System	
7	Standby Generator Set	
8	CCTV System	
9	Sundry Items	
	Total Schedule 4	**R**

ABOVE TOTAL TO BE CARRIED FORWARD TO C2.3.6: FINAL SUMMARY

C2.3.5 SCHEDULE OF QUANTITIES:
TAFALOFEE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

SCHEDULE 5 : FIRE DETECTION AND FIRE EXTINGUISHING

Amounts in this Schedule of Quantities are to be transferred to Final Summary C2.3.6

Section	Name	Amount
1	Preliminary and General	
2	Analogue addressable Fire Alarm System	
3	Fire Fighting Equipment	
	Total Schedule 5	**R**

ABOVE TOTAL TO BE CARRIED FORWARD TO C2.3.6: FINAL SUMMARY

C2.3.6: FINAL SUMMARY
TAFALOFEE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS
SCMU5-24/25-0037

SCHEDULE OF QUANTITIES : FINAL SUMMARY

Amounts in this Final Summary are transferred to Form of Offer and Acceptance C1.1

Section	Name	Amount
Schedule 1	Preliminary Sections	R
Schedule 2	Civil Works	R
Schedule 3	Specialist Mechanical & Electrical Installations	R
Schedule 4	Electrical and Controls	R
Schedule 5	Fire Detection and Fire Extinguishing	R
	Sub Total	R
	Add: Contingency Amount	R 4,000,000-00
	Sub total	R
	Add: Allowance for Contract Price Adjustment	R 2,800,000-00
	Sub total	R
	Add 15% Value Added Tax to sub-total	R
TOTAL CARRIED FORWARD TO C1.1: FORM OF OFFER AND ACCEPTANCE ON PAGE 68		R

PART C3 SCOPE OF WORKS

REFER TO ANNEXURE B

ANNEXURE A

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 A, PSA	**SECTION 1: PRELIMINARY AND GENERAL**					
1.1	8.3	**Fixed charge items:**					
		For the Construction Period:					
1.1.1	8.3.1	Contractual requirement (sureties, insurance etc.)	Sum				
	8.3.2, PS6, PS7	**Establish Facilities on the Site:**					
1.1.2	PS7.2	*Facilities for the Engineer:*					
1.1.2.1	8.3.2.1 a)	Shared and conference facilities	Sum				
1.1.2.2	8.3.2.1 c), PS7.2	Project Name Board (1 No)	Sum				
1.1.3	8.3.2.2, PS7.1	*Facilities for the Contractor:*					
1.1.3.1		a) Offices and storage sheds	Sum				
1.1.3.2		b) Workshops	Sum				
1.1.3.3	8.3.2.2 c), PSA.2	c) Laboratories and quality control	Sum				
1.1.3.4		d) Living accommodation	Sum				
1.1.3.5		e) Ablution and latrine facilities	Sum				
1.1.3.6		f) Tools and equipment	Sum				
1.1.3.7		g) Water supplies, electric power and communications	Sum				
1.1.3.8		h) Dealing with water ingress and stormwater	Sum				
1.1.3.9		i) Access	Sum				
1.1.4	8.3.3	Further fixed-charged obligations:					
1.1.4.1		Other fixed-charged obligations	Sum				
1.1.4.2		Additional fixed charges, costs, administration and supervision relating to SME subcontractors	Sum				
1.1.4.3		Compliance with Environmental Management Specification (attached)	Sum				
1.1.4.4	BSL	Fixed charges for implementation of EPWP in accordance with Guidelines, including co-ordination, administration, reporting etc.	Sum				
1.1.4.5		Supply of orange overalls with 30cm EPWP logos to labour recruited for the execution of task marked as LI in this schedule	Sum				
1.1.5	8.3.4	Removal of site establishment	Sum				
1.1.6		Fixed Charges for the Operation and Maintenance Period:					
1.1.6.1		Contractual requirements	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
1.1.6.2		Other fixed-charged obligations:	Sum				
1.1.6.3		Compliance with Construction Occupational Health and Safety Regulations	Sum				
1.2	8.4, PSA.3	**Time-related items:**					
		For the Construction Period:					
1.2.1	8.4.1	Contractual requirements	Sum				
	8.4.2	Operations and Maintenance of Facilities on Site for Duration of Construction:					
1.2.2	8.4.2.1	*Facilities for Engineer, Except where otherwise stated:*					
1.2.2.1	8.4.2.1 c), PS7.2	Project Name Board (1 No)	Sum				
1.2.3	8.4.2.2	*Facilities for Contractor, Except where otherwise stated:*					
1.2.3.1		a) Offices and storage sheds	Sum				
1.2.3.2		b) Workshops	Sum				
1.2.3.3	8.4.2.2, PSA.2	c) Laboratories and quality control	Sum				
1.2.3.4		d) Living Accommodation	Sum				
1.2.3.5		e) Ablution and latrine facilities	Sum				
1.2.3.6		f) Tools and equipment	Sum				
1.2.3.7		g) Water supplies, electric power and communications	Sum				
1.2.3.8		h) Dealing with water ingress and stormwater	Sum				
1.2.3.9		i) Access	Sum				
1.2.4	8.4.3	Supervision for duration of construction.	Sum				
1.2.5	8.4.4	Company and head office overhead for the duration of the contract.	Sum				
1.2.6	8.4.5	Other time-related obligations	Sum				
1.2.6.1		Additional time related charges, costs, administration and supervision relating to SME subcontractors	Sum				
1.2.6.2		Compliance with Environmental Management Specification (attached)	Sum				
1.2.6.3	BSL	Time related charges for implementation of EPWP in accordance with Guidelines, including co-ordination, administration, reporting, mark-ups on EPWP provisional Sums etc.	Sum				
		Time related charges for Operation and Maintenance Period (24 months):					
1.2.7		Supervision and management	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
1.2.8		Company and head office overheads	Sum				
1.2.9		Other time-related obligations	Sum				
1.2.10		Compliance with Construction Occupational Health and Safety Regulations	Sum				
1.3	8.5	**Provisional Sums:**					
1.3.1		Joinery installations and furniture for conversion of filter room to laboratory/ office	Sum			100,000	00
1.3.2		% mark up to cover Overheads Charges and Profit on previous item	%	100,000.00			
1.3.3		Procure laboratory test equipment or other purchases and hired in services required by the Employer	Sum			400,000	00
1.3.4		% mark up to cover Overheads Charges and Profit on previous item	%	400,000.00			
1.4	8.5	**Provisional Sums relating to EPWP, community liaison, student employment etc:**					
		Mark-ups, overheads and profit is deemed to be included elsewhere					
1.4.1		Allowance for EPWP training, accommodation, transport and payment of wages during training as if employed on site	Sum			340,000	00
1.4.2		Provision for the payment of Community Liaison Officer	Sum			153,000	00
1.4.3		Provision for the payment of four Project Steering Committee Members for attendance of monthly progress meeting on site at R250-00 per meeting per member	Sum			21,600	00
1.5	8.5	**Provisional Sums :**					
1.5.1	8.5 b(1)	Provisional sum for horisontal drilling under buildings for installation of water pipes under buildings.	Sum			400,000	00
1.5.2	8.5 b(2)	% mark up to cover Overheads Charges and Profit on previous item	%	400,000.00			
1.5.3	8.5 b(1)	Provisional sum for emetgency repairs to building and infrastructure	Sum			4,750,000	00
1.5.4	8.5 b(2)	% mark up to cover Overheads Charges and Profit on previous item	%	4,750,000.00			
Total Carried Forward To Summary							

Section 2 : Occupational Health and Safety Regulations

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 2 : OCCUPATIONAL HEALTH & SAFETY REGULATIONS					
2.1		Preparation of principal contractor's site specific health and safety plan, safety file, risk assessments, fall prevention/protection plan, Annexure 2 notification to Department of Labour, demolition method statement, other method statements requested to be prepared for safety reasons, permits, amendments to safety plan during course of project, traffic management/accommodation plans, and any other legally required health and safety documentation	Sum				
2.2		Provision of safety documentation required of the principal contractor for Construction Work Permit application by the safety agent of Department of Labour, if applicable	Sum				
2.3		Health and safety management of principal contractor's employees, visitors and contractors employees on site.	Sum				
2.4		Provision of full time Construction Manager for site, provision of Alternate Construction Manager in absence of Construction Manager and provision of sufficient safety supervision on site	Sum				
2.5		Provision of full time/part time SACPCMP register Construction Health & Safety Officer for site (refer to safety specification for full time/part time requirements) and preparation of safety reports after each safety inspection	Sum				
2.6		Competence assessment, appointment and required competence and safety training of all principal contractor's legally required appointments for site	Sum				
2.7		Maintenance of principal contractor's plant and equipment on site so as to be in safe condition, including inspection registers, inspections by competent persons, thorough examination certificates, hand over certificates and related documentation	Months	18			
2.8		Provision of general safety signage (e.g.: first aid, fire fighting, traffic safety, excavations, PPE, Assembly Point, noise zones, etc.)	Months	18			
2.9		Provision of medical certificates of fitness for employees on site (Annexure 3)	Sum				
2.10		Provision of personal protective equipment (PPE) by principal contractor to employees and, as applicable, visitors to site, including:					
2.10.1		Reflective vests	Sum				
2.10.2		Hard hats	Sum				
2.10.3		Protective foot wear	Sum				
2.10.4		Hearing protection	Sum				
2.10.5		Respiratory Protection	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
2.10.6		Safety eyewear	Sum				
2.10.7		Gloves	Sum				
2.10.8		Overalls	Sum				
2.10.9		Safety Harness	Sum				
2.11		Holding of safety meetings with safety representatives and safety officers on site on at least monthly basis	Monthly	18			
2.12		Principal contractor construction safety management attendance at health and safety meetings called by client, professional team or safety agent	Monthly	18			
2.13		Provision of site specific health and safety induction training for all on site	Sum				
2.14		Conducting of toolbox talks to employees on health and safety issues on a weekly basis	Sum				
2.15		Provision of sufficient First Aiders for site as per legal requirements	Sum				
2.16		Provision of First Aid Boxes for site as per legal requirements	Sum				
2.17		Provision of sufficient fire extinguishing equipment for site	Sum				
2.18		Fire drills on site at least 6 monthly basis for duration of project	Sum				
2.19		Provision of welfare facilities for site (drinking water, toilets, soap, means of drying hands, toilet paper, sheltered eating areas, etc.)	Sum				
2.20		Provision for safe disposal of waste, spill kits, safe housekeeping and storage practices	Sum				
2.21		Provision of leading edge protection, covers to prevent falls	Sum				
2.22		Provision of fencing at site camp and to protect excavations	Sum				
2.23		COVID-19 measures - provision of hand sanitiser, respiratory protection (as required), safety signage, formal and informal communication to all on site and any other measures necessary to contain and detect COVID 19 on site (refer to safety specification)	Sum				
2.24		Compilation of consolidated Safety File at Close Out stage and handover of file to project client	Sum				
2.25		Any other compliance item in site specific safety specification issued by project client/safety agent with potential cost implication (Tenderer to stipulate)					
2.25.1		....	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
2.25.2		....	Sum				
2.25.3		....	Sum				
2.25.4		....	Sum				
2.25.5		....	Sum				
2.26		Principal contractor's general compliance with respect to the Occupational Health and Safety Act, Construction and other health and safety Regulations apart from other provisions in this bill	Sum				
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 A	**SECTION 3: DAYWORKS**					
		The items below are provisional and only applicable upon specific written instruction to carry out work on a day works basis					
3.1	8.7, PSA.4	**Dayworks (Provisional) :**					
3.1.1		Materials	Sum	1		300,000	00
3.1.2		% Profit, mark up, overheads and cost	%	300,000.00			
3.2		Labour (including al mark-ups and profit):					
3.2.1		Task Grade 1 & 2 e.g. General Worker, Artisan Aid	Days	100.0			
3.2.2		Task Grade 3 & 4 e.g. Construction hand Gr II or III, Driver Grade II	Days	50.0			
3.2.3		Task Grade 5 & 6 e.g Construction Hand Grade 1 or Operator Grade I	Days	30.0			
3.3.3		Task Grade 7 e.g. Supervisor Grade I	Days	15.0			
3.3.4		Task Grade 8 e.g. Supervisor Grade II	Days	15.0			
3.3.5		Task Grade 9 e.g. Artisan (Welder, Fitter and Turner)	Days	40.0			
3.3		Plant and equipment (wet rates, including mark-ups and operators):					
3.3.1		1 ton light delivery vehicle	km	2,500.00			
3.3.2		8 ton flat bed truck	km	1,000.0			
3.3.3		8 ton flat bed truck with 8.5 ton. 6m reach truck crane	km	300.0			
3.3.4		4x4 backhoe loader (74 kW) (1st day, establishment and de-establish)	Days	1.0			
3.3.5		4x4 backhoe loader (74 kW) for days after 1st day	Days	3.0			
3.3.6		Hitachi EX200 or equivalent backhoe excavator (1st day, establishment and de-establish)	Days	1.0			
3.3.7		Hitachi EX200 or equivalent backhoe excavator for days after 1st day	Days	3.0			
3.3.8		"Bobcat" 25kW skid steer loader (1st day, establishment and de-establish)	Days	1.0			
3.3.9		"Bobcat" 25kW skid steer loader for days after 1st day	Days	4.0			
3.3.10		650mm 7kW walk behind drum roller (1st day, establishment and de-establish)	Days	1.0			
3.3.11		650mm 7kW walk behind drum roller after first day	Days	3.0			
3.3.12		Tool box (set of hand tools with spanners, hammers, saws, wrenches)	Days	50.0			
Total Carried Forward							

Section 3 : Dayworks

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
3.3.14		120 lit/sec 700kPa diesel driven compressor with breakers, hoses and bits (1st day, establishment and de-establish)	Days	1.0			
3.3.15		120 lit/sec 700kPa diesel driven compressor with breakers, hoses and bits after 1st day	Days	3.0			
3.3.16		Oxy-acetylene welding set	Days	3.0			
3.3.17		250 A 380V 3 phase TIG/MIG MMA welder set	Days	5.0			
3.3.18		380V 3 phase 25kVA portable generator	Days	5.0			
3.3.19		230V single phase 5kVA portable generator	Days	5.0			
3.3.20		Contractors submersible sludge pump with hoses, 40m³/h @ 10 0kPa capacity	Days	5.0			
3.3.21		1 kW hammer drill	Days	5.0			
3.3.22		600W hand drill	Days	5.0			
3.3.23		2000W angle grinder	Days	5.0			
3.3.24		2000W circular cut-off saw	Days	5.0			
3.3.25		Plant and equipment not scheduled above	Sum			300,000	00
3.3.26		% Profit on previous item to cover overheads and cost.	%	300,000.00			
3.3.27		Labour not scheduled above	Sum			250,000	00
3.3.28		% Profit on previous item to cover overheads and cost	%	250,000.00			
Total Carried Forward To Summary							

Section 4 : SMME Packages

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 4 : SMME PACKAGES					
	PS8.7	The following items is for parts of the Works to be done by SME Subcontractors under the supervision and co-ordination of the Main Contractor					
4.1		SME Package No 1: Clearing of Vegetation	Sum			550,000	00
4.2		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	550,000.00			
4.3		SME Package No 2: Weeding of Block Paving Roads and mowing of lawns	Sum			300,000	00
4.4		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	300,000.0			
4.5		SME Package No 3: Building Work	Sum			600,000	00
4.6		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	600,000.0			
4.7		SME Package No 4: Building Renovations	Sum			250,000	00
4.8		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	250,000.00			
4.9		SME Package No 5: Stock Fencing	Sum			950,000	00
4.10		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	950,000.00			
4.11		SME Package No 6: Plumbing and sanitary wares repairs	Sum			600,000	00
4.12		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	600,000.00			
4.13		SME Package No 7: Clearing of Vegetation (Operation and Maintenance Period)	Sum			530,000	00
4.14		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	530,000.00			
Total Carried Forward							

Section 4 : SMME Packages

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
4.15		SME Package No 8: Weeding of Block Paving Roads (Operation and Maintenance Period)	Sum			320,000	00
4.16		% Profit mark-up, overheads and cost for co-coordinating and dealing with SME Subcontractors.	%	320,000.00			
Total Carried Forward To Summary							

Section 1: Site Clearance

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200C	**SECTION 1: SITE CLEARANCE**					
1.1		**Clearing for Construction:**					
1.1.1	8.2.1, PSC.1	Clearing and grubbing of fence lines 3m wide for erection of fence around dam	m	1,130.00			
1.1.2	8.2.1, PSC.2	Clearing and grubbing of pipeline routes 2m wide	m	4,865			
1.1.3	8.2.1, PSC.2	Grub and clear for buildings and other areas where instructed	m²	445.00			
1.2	PSC.7	**Removal of asbestos building material:**					
		The rates below are fully inclusive for meeting of all requirements of the Asbestos Abatement Regulations 2020, work carried out by a suitably graded subcontractor, including dismantling, removal to a site that meets the requirements of Regulations and issue of CoC after making safe.					
1.2.1		Administrative requirements	Sum				
1.2.2		Establish on site	Sum	1.0			
1.2.3		Take down and disposal of asbestos roof on chlorine hut, approximate size 4x4m	Sum				
1.2.4		Take down and disposal of asbestos fascia boards on floc dosing building, approximate size 6.0x6.0m	Sum	1.0			
Total Carried Forward							

Section 1: Site Clearance

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
1.3	PSC.8	**Demolition of structures and buildings :**					
		The rates below are fully inclusive for the the complete demolition disposal in and approved manner and transport of debris off site or use as fill where permitted					
1.3.1		Demolish chlorination hut at STW, including floor and plinth, excluding foundations (±3.0x2.5m) (Ref Fig 5)	Sum				
1.3.2		Demolish double storey floc dosing building, excluding suspended floor (Ref Fig 6)	Sum				
1.3.3		Demolish elevated flocculation channel, excluding suspended slab and foundations (±4.0x9.6m) (Ref Figure 6 & 8)	Sum				
1.3.4		Demolish existing settling tank with masonry walls, excluding floor and foundations (±2.3deep x 3.3m wide x 9.6m long) (Fig 6 &7)	Sum				
1.4		**Breaking up of concrete and foundations:**					
1.4.1	PSC.9	Break up reinforced suspended slabs	m^3	15.3			
1.4.2	PSC.10	Break up foundations and solid unreinforced members	m^3	21.6			
1.4.3		Break up existing concrete aprons and walkways up to 120mm thick	m^3	137.0			
1.4.4		Cutting of concrete walkways with diamond saw, 100mm deep before breaking up.	m	3,740.0			
1.5		**Lifting of existing paving:**					
1.5.1		Lift existing 60mm interlocking paving, load and transport within free haul distance and stockpile	m^2	480.0			
1.5.2		Lift existing Figure 3 kerbs, transport within free haul distance and stockpile	m	320.0			
1.6	8.2.2	**Cut down large trees and dispose, excluding grubbing of roots, but including all transport with girths: (Provisional)**					
		Over Up to and incl.					
1.6.1		1m 2m	No	5.00			
1.6.2		2m 3m	No	3.00			
		Grub tree roots cut down under previous items:					
1.6.3		Trunk girth between between 1.0m and 2.0)	No	5.00			
1.6.4		Trunk girth between between 2.0m and 3.0m)	No	3.00			
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 D, PSD, LI	**SECTION 2: EARTHWORKS**					
2.1	8.3.1.1, PSD.2	Clear and strip for spillway embankment excavations and other areas where instructed	m²	600.0			
2.2	8.3.1.2, PSD.2	Removal of topsoil to a nominal depth of 200mm and stockpile	m³	120.0			
2.3	8.3.3 a)	**Restricted Excavations:**					
		Restricted excavations in all materials and use for backfill ore embankment or dispose for the followings:					
2.3.1	PSD.2	Steep embankment above dam spillway to batter back to 1v:3h gradient and trim and compact	m³	500.0			
2.3.2	PSD.3	Existing spillway to bed gabions and mattresses	m³	578.0			
2.3.3	LI	Circular base for prefabricated reservoir	m³	12.0			
2.3.4	LI	Foundations and footings for building etc., up to 1,0m deep	m³	20.0			
2.3.5	PSD.4	Channels in hospital boundary fence	m³	244.0			
2.3.6	PSD.4	Forming of cut-off drains near dam spillway	m³	130.0			
2.3.7	PSD.4	Shaping and trimming of soil surfaces for drainage purposes	m³	160.0			
2.4	8.3.3 (b)	**Extra over for excavations in:**					
2.4.1		Intermediate excavations.	m³	655			
2.4.2		Hard rock excavations (PROVISIONAL)	m³	130			
2.5	8.3.4	**Imported Filling from commercial sources**					
2.5.1		Import G5 natural gravel, stabilize with 3% cement by weight and compact to 93% as filling under rip-rap on the upstream dam embankment, with gradient of 1: 3, to reinstate surface	m³	800.0			
2.5.2		Import G7 natural gravel and compact to 93% as filling under storm water channels, linings, pond verge protection and walkways	m³	190.0			
2.5.3		Import G6 natural gravel and compact to 93% in 150mm layer under paving where instructed	m³	172			
2.6	8.3.10	**Top soiling:**					
2.6.1	LI	Spread topsoil from stockpiles on 1v:3h embankments and tamp down to 150mm nominal thickness	m³	120.0			
2.7		**Vegetation:**					
2.7.1	LI	Spread grubbed vegetation from stockpile on embankment and rake in	m²	800.0			
Total Carried Forward							

Section 2: Earthworks

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
2.7.2	LI	Sowing of indigenous grass mixture and water until established (Provisional)	m²	800.0			
2.7.3	LI	Planting of Kikuyu strips 200mm apart, fertilize at 50g/m² and water until established (Provisional)	m²	200.0			
2.8		Storm water control	Sum				
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200DB	**SECTION 3: EARTHWORKS (PIPE TRENCHES)**					
		The items below marked (LI) must be done in a labour intensive manner as described in the project specification according to EPWP standards					
	PSL.10	*The earthworks in this section will be dones close to existing buildings and other services and must include for these circumstances with limited access for equipment.*					
		Excavations:					
3.1	8.3.3 (a)	Excavate in all materials for pipe trenches, selecting, backfilling, compacting to 95% and dispose of surplus material for:					
		nominal pipe diameters up to 125mm and the following trench depths:					
		Over Up to and incl.					
3.1.1		0 1.0m	m³	480			
3.1.2		1,0 2.0m	m³	2,996			
3.1.3		2.0 3.0m	m³	20			
		nominal pipe diameters greater than 125mm but smaller than 450mm and the following trench depths:					
		Over Up to and incl.					
3.1.4		0 1.0m	m³	50.0			
3.1.5		1,0 2.0m	m³	2,040.0			
3.1.6		2.0 3.0m	m³	40.0			
3.1.7	PSDB.1	Extra over above excavation items, for excavations by hand where access is limited for machinery, for trenches not deeper than 1,5m	m³	1,140.0			
3.1.8	BSL, LI	**Extra over Items 3.1 for excavations in a Labour Intensive manner not deeper than 1,5m in:**					
3.1.8.1	LI	Material with consistency up to medium dense or firm.	m³	1,000.0			
3.1.8.2	LI	Material with consistency up to dense or stiff.	m³	1,000.0			
3.1.8.3	LI	Material with consistency up to very dense or very stiff.	m³	200.0			
3.2		**Extra over 8.2.3 a) for excavations in:**					
3.2.1	8.3.2(b)	Intermediate excavations	m³	410.0			
3.2.2	8.3.2(b)	Hard rock excavations	m³	350.0			
Total Carried Forward							

Section 3: Earthworks (Pipe Trenches)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
3.3	8.3.2.(c)	Excavate unsuitable material or in wet conditions and dispose within free-haul distance of 0.7km and inclusive of keeping dry of excavations. (PROVISIONAL)	m^3	200.0			
3.4	8.3.3.1 (a)	Make up deficiency in backfill material from other excavations on site. (PROVISIONAL)	m^3	400.0			
3.5		**Road crossing repairs:**					
3.5.1	8.3.3.3	Compaction and selection of material, stabilize with 3% cement by weight and compact to 96%	m^3	80.0			
3.5.2		Import G3 natural gravel from commercial source, stabilize with 3% cement by weight and compaction to 98%, in 150mm layer to reconstruct pavement layers.	m^3	50.0			
		Existing services:					
3.6	8.3.5	Excavate by hand to locate and expose existing services to carry out repairs (excluding sewers to be replaced).	m^3	150.0			
3.7		**Protection of existing services:** (This item will only apply once per location or services)					
		The items below is only applicable to existing services and will not apply to services to be installed or removed under this contract					
	8.3.5 (a), PSDB.1	Services crossing trenches:					
3.7.1		Electrical cables	No	20			
3.7.2		Water pipes	No	200			
3.7.3		Sewers	No	50			
3.7.4		Storm water pipes	No	10			
3.7.5		Electronic communication cable	No	6			
	8.3.5 (b)	Services adjoining trenches:					
3.7.6		Electrical cables	m	200.0			
3.7.7		Water pipes	m	500.0			
3.7.8		Sewers	m	200.0			
3.7.9		Storm water pipes	m	50			
3.7.10		Electronic communication cable	m	20.0			
3.8		Electrical cable detection equipment and searching for cables for the duration of the contract	Sum				
3.9		Accommodation of Traffic	Sum				
3.10		Storm water control	Sum				
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 DE, PSDE	**Section 4: SMALL EARTH DAMS**					
4.1	PSDE.2	Laying dry for construction of partition embankment, including temporary works, pumps etc.	Sum				
4.2	8.3.1.1	Clear and strip vegetation from verges where instructed	m²	360.0			
4.3	8.3.3 a)	Excavate silt and unsuitable material under partition embankment	m³	250.0			
4.4	8.3.4	Preparation of soil surfaces in preparation of construction of partition embankment	m²	504.0			
4.5	8.3.5, PSDE.3	Forming of embankment of selected impervious material	m³	495.0			
4.6	8.3.8	**Overhaul:**					
4.6.1		Short overhaul 0,5 to 1,0 km	m³	200.0			
4.6.2		Long overhaul, over 1,0km	m³	400.0			
4.7	PSDE.4	**Imported Material:**					
4.7.1		Extra over for impervious material imported from commercial sources, including transport (Provisional)	m³	100.0			
4.8	PSDE.5	**Rip rap:**					
4.8.1		Import from commercial sources and place angular stone rip rap with nominal diameter between 150 and 250mm on geotextile under submerged conditions.	m³	180.0			
4.8.2	SABS 1200 DK 8.2.4	Double layer of Bidim A4 geotextile under dump rock toe anchor, including allowance for overlaps and waste	m²	480			
Total Carried Forward To Summary							

Section 5: Gabions & Pitching

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200DK	**SECTION 5: GABIONS & PITCHING**					
		The items below marked (LI) must be done in a labour intensive manner as described in the project specification.					
5.1	PSDK.2	**Erosion protection of existing spillway chute:**					
5.1.1	8.2.1(a)	**Prepare surfaces to bed gabions by:**					
5.1.1.1	LI, 8.2.1(a)	Cavities filled with approved excavated material or rock	m³	700			
5.1.1.2	8.2.1(b)	Cavities filled with Class 15/19 concrete where instructed	m³	180			
5.1.2	8.2.2 (LI)	**Gabions and revetment mattresses of ø3,0mm wire woven mesh galvanized cages :**					
5.1.2.1		1,0 x 1,0 x 1,0m	m³	700			
5.1.2.2		1,0 x 1,0 x 0,5m	m³	100			
5.1.2.3		0,5 deep x 3,0 x 1,0m	m³	200			
5.1.2.4		0,5 deep x 2,0 x 1,0m	m³	100			
5.1.2.5		0,3 deep x 2,0 x 1,0m	m³	140			
5.1.3	8.2.4	Bidim A4 geotextile under gabions and mattresses, including allowance for overlaps and waste	m²	1,730			
5.1.4		Grout up of surfaces of gabions and mattresses to a depth of nominal 150mm with a 14MPa cement:sand mix where instructed (Provisional)	m²	400.0			
5.2	PSDK.3	**Reinstatement of rip rap against earth dam wall, fence stomwater overpasses, and stock watering ramps:**					
5.2.1		**Prepare surfaces to bed gabions by:**					
5.2.1.1	LI, 8.2.1(a)	Cavities filled with approved excavated material or rock	m³	30			
5.2.1.2	8.2.2(b)	Cavities filled with Class 15/19 concrete where instructed	m³	40			
5.2.2	LI, 8.2.2	**Gabions and revetment mattresses of ø3,0mm woven mesh galvanized wire cages :**					
5.2.2.1		1,0 x 1,0 x 1,5m	m³	124			
5.2.2.1		1,0 x 1,0 x 1,0m	m³	84			
5.2.2.2		1,0 x 1,0 x 0,5m	m³	15			
5.2.2.3		0,3 deep x 2,0 x 1,0m	m³	251			
5.2.2.4		0,3 deep x 1,0 x 1,0m	m³	150			
5.2.3	8.2.4	Bidim A4 geotextile under gabions and mattresses, including allowance for overlaps and waste	m²	2,709			
Total Carried Forward							

Section 5: Gabions & Pitching

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
5.3	PSDK.4	**Gabions and revetment mattresses in hospital boundary:**					
5.3.1		**Prepare surfaces to bed gabions by:**					
5.3.1.1	LI, 8.2.1(a)	Cavities filled with approved excavated material or rock	m³	10			
5.3.1.2	8.2.1(b)	Cavities filled with Class 15/19 concrete where instructed	m³	5			
5.3.2	8.2.2, LI	**Gabions and revetment mattresses of ø2,2mm woven mesh galvanized wire cages :**					
5.3.2.1		1,0 x 1,0 x 1,0m	m³	11			
5.3.2.2		0,5 deep x 3,0 x 1,0m	m³	3			
5.3.2.3		0,3 deep x 3,0 x 1,0m	m³	1			
5.3.2.4	8.2.4	Bidim A4 geotextile under gabions and mattresses, including allowance for overlaps and waste	m²	15			
5.4	8.2.5, PSDK.5, LI	**Pitching and linings :**					
5.4.1		Flexible wire tied 340x294x115 grass block lining to channels and surfaces, including wire and end anchor pegs where applicable, for the following :					
5.4.1.1		Cut-off drain at spillway with Armorflex 180 or similar approved, 1.2m wide invert and and 670mm deep with 1:1,5 batters	m²	300.0			
5.4.1.2	PSDK.6	Stock drinking access ramps on verge of dam, installed under submerged conditions with Armorflex 180.	m²	680.0			
5.4.1.3		As rip rap against 1:3 gradient for partition embankment in Pond No 1 under submerged conditions with Armorflex 205.	m²	420.0			
5.4.1.4		Lined stormwater channels, drainage routes at wastewater treatment plant with Armorflex 180 or similar	m²	870.0			
5.4.1.5		Pond verge protection with Armorflex 205 or similar approved	m²	280.0			
5.4.2	8.2.4	Bidim A4 geotextile under flexible grass block linings including allowance for overlaps and waste	m²	2,810			
Total Carried Forward To Summary							

Section 6: Concrete (Structural)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200G	**SECTION 6: CONCRETE (STRUCTURAL)**					
		All rates must be fully inclusive to complete the work, including 20 x 20mm chamfers to all visible corners.					
6.1	8.2	**Form work:**					
6.1.1	8.2.1	Smooth formwork on radius to inside and outside of bases for circular tanks not higher than 300mm	m	56.5			
6.1.2	8.2.1	Smooth formwork to edges of exterior plinths for plant and equipment, not higher than 400mm	m	19.00			
6.1.3	8.2.3	Special Smooth vertical form work to pipe support columns in pump stations not wider than 500mm and not higher than 800mm	m²	5.00			
6.1.4	8.2.2	Smooth vertical form work to edges of walkways and edge beams, not higher than 400mm	m	320.00			
6.1.5	8.2.2	Smooth vertical form work to edges of aprons and small channels, not higher than 150mm	m	83.00			
6.1.6	8.2.1	Rough vertical formwork to stream crossings for fences, not higher than 1,5m	m²	100.0			
6.1.7	8.2.3	Forming of cradle to column tops for pipes (100-200ø)	No	7.00			
6.1.8	8.2.3	Smooth form work to pump plinths end exterior equipment support slabs, not higher than 400mm	m²	19.2			
6.1.9	8.2.3	Special Smooth horizontal to soffits of roof slabs and overhangs .	m²	90			
6.1.10	8.2.3	Extra over previous item for 300mm wide external roof overhangs, including drip groove.	m	45.5			
6.1.11	8.2.2	Smooth vertical shuttering to sides of concrete encasing of pipe crossing over channels, max 1,0m above ground, not higher than 700m	m²	8			
6.1.12	8.2.2	Smooth horizontal shuttering to soffits of concrete encasing of pipe crossing over channels, max 1,0m above ground, not wider than 900mm	m²	5			
6.1.13	8.2.6	Cutting of holes in shuttering and casting in of pipes through walls for the following diameters (measured per face passing through):					
6.1.13.1		100ø	No	6.00			
6.1.13.2		150ø	No	8.00			
6.1.13.3		200ø	No	2.00			
Total Carried Forward							

Section 6: Concrete (Structural)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
6.2	8.3.1	**Reinforcing bars:**					
6.2.1		High yield bars	kg	7,200			
6.2.2		Mild steel bars	kg	100			
6.3	8.3.1	**High tensile weld mesh:**					
6.3.1		Ref 100	m²	79			
6.3.2		Ref 193	m²	250.0			
6.3.3		Ref 245	m²	2,268.0			
6.3.4		Ref 311	m²	50.0			
6.3.5		Ref 617	m²	20.0			
6.4		**Concrete:**					
6.4.1	8.4.2	Class 15/19 50mm blinding under reinforced concrete structures and footings	m³	4.90			
6.4.2	8.4.3	Class 25/19 concrete in reinforced strip foundations, circular tank foundations, and bases	m³	22.0			
6.4.3	8.4.3	Class 20/19 concrete in fence stream crossings at dam	m³	53.0			
6.4.4	8.4.3	Class 25/19 concrete in pump and equipment plinths and stairs	m³	19.5			
6.4.5	8.4.3	Class 25/19 concrete in 100 to 125 mm surface beds	m³	9.6			
6.4.6	8.4.3	Class 25/19 concrete in walkways, aprons and associated edge beams	m³	95.6			
6.4.7	8.4.3	Class 30/19 concrete in roof slabs.	m³	19.7			
6.4.8	8.4.3	Class 20/19 concrete in anchor blocks and concrete encasing, including shuttering.	m³	20.00			
6.4.9	8.4.3	Class 25/19 concrete in concrete encasing of pipes above ground	m³	10.00			
6.5		**Screed to falls on roof slabs:**					
		Toppings and screeds with 9.5mm aggregate, sand compliant with SANS 1083 and cement to SANS 50197-1 Type CEM I or CEM IIA:					
6.5.1	PW371	Wood floated topping to falls with 40 to 120mm thickness on concrete roofs, ready to receive waterproofing membrane	m³	6.8			
6.5.2		Screeds to falls in chlorine contact tank and inlet screen, steel floated finish.	m³	1.40			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
6.6	8.4.4	**Unformed surface finishes to concrete:**					
6.6.1		Wood floated to surface beds ready for screeds and toppings	m²	74			
6.6.2		Wood floated to roof slabs, ready to receive screeds to falls.	m²	86			
6.6.3		Tops of foundations and plinths	m²	98			
6.6.4		Broom finish to walkways and aprons with edges finished with nosing tool	m²	673			
6.6.5		Finishing in non-slip broom finish with nosings to edges	m²	3.6			
6.7	8.7(a)	40MPa grouting under base plates, pump frames and WWTW platform HD-bolts, ect.	ℓ	30.0			
6.8	8.5	**Joints:**					
6.8.1		100x10mm "Jointex" joints with 10x10 with poly-urethane joint sealant against walls	m	279			
6.8.2		Forming of movement joints between walkway and apron panels, including shuttering, DPM bond breaker and finished with nosing tool for concrete up to 150mm thick	m	532			
6.9		**Reinstate Sludge waste channel:**					
		(The figures refered to below appear in the Project Specifications)					
6.9.1	PSG.1	Repair cracked end of sludge waste channel, including wet-to-dry concrete agent (Refer to Figure 11)	Sum				
6.9.2	PSG.2	Break up section of sludge waste channel to install pipe culvert (Refer to Fig 12)	m	5.0			
6.9.3	PSG.2	Reconstruct sludge waste channel complete with floor, brick walls, plaster and invert benching up to a maximum wall height of 765mm (Refer to Fig 12)	m	5.0			
6.10		**Repair work to existing concrete reactor:**					
		(Refer to Dwg No E765-105 for "as-built" of reactor)					
6.10.1		Empty concrete reactor by pumping out and remove all sludge and accumulated debris and foreign objects	Sum				
6.10.2		Clean concrete surfaces with pressure washer and inspect	Sum	1.0			
6.10.3		Chip away defective concrete with a light breaker to a maximum depth of 40mm	m²	2.00			
6.10.4		Chip away defective concrete with light a light breaker deeper than 40mm (concrete cover) and to a maximum depth of 100mm	m²	0.50			
Total Carried Forward							

Section 6: Concrete (Structural)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
6.10.5		Repair concrete with Sika MonoTop 412 or similar approved non-shrink repair mortar	ℓ	130.0			
6.11		**Repairs and reinstatement of concretework and stormwater:**					
		The items below are for the reinstatement of existing concrete work, channels etc. after the installation of new pipelines.					
6.11.1		275µm damp proof membrane	m²	1,199.0			
6.11.2		25MPa concrete in aprons and surface beds	m³	137.0			
6.11.3		Surface finish of new aprons and surface beds with wood trowel	m	1,199.0			
6.11.4		Forming of joints between panels with shuttering and nosing tool, both sides	m	1,134.0			
6.11.5		Forming of joints between cut edge of existing concrete with nosing tool	m	3,780.0			
6.11.6		Supply and install new 150ø pre-cast half round channels on mortar bed to match existing	m	60.0			
6.11.7		Supply and install new 200ø pre-cast half round channels on mortar bed to match existing	m	150.0			
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 L	**SECTION 7: MEDIUM PRESSURE PIPELINES**					
		The items in this section will be installed close to existing buildings and other services and must include for these circumstances.					
7.1	8.2.1, PSL.1 PSL.1	**Supply and lay the following uPVC pipes and fittings, complete with sockets to SABS 966 and rubber seal rings on Class B bedding, or in concrete encasing:**					
		Pipes:					
7.1.1		200mm dia Class 12	m	12.0			
7.1.2		160mm dia Class 12	m	1,100.0			
7.1.3		110mm dia Class 12	m	380.0			
7.1.4		90mm dia Class 12	m	50.0			
7.1.7		200mm dia Class 6	m	12.0			
7.1.8		110mm dia Class 6	m	30.0			
7.1.9		90mm dia Class 6	m	500.0			
7.1.10		75mm dia Class 6	m	670.0			
7.1.11		63mm dia Class 6	m	140.0			
	8.2.2	Class 16 uPVC bends with sockets to SABS 966:					
7.1.12		200mm dia 90°	No	1			
7.1.13		200mm dia 45°	No	3			
7.1.14		160mm dia 90°	No	8			
7.1.15		110mm dia 90°	No	6			
7.1.16		110mm dia 45°	No	2			
7.1.17		90mm dia 90°	No	12			
7.1.18		90mm dia 45°	No	1			
7.1.19		75mm dia 90°	No	13			
7.1.20		75mm dia 45°	No	2			
7.1.21		63m dia 90°	No	15			
7.1.22		63m dia 45°	No	10			
7.2	8.2.1, PSL.1	**Supply and lay HDPe pipe to SANS/ISO4427 and bed on Class B bedding complete with couplings for the following nominal diameters:**					
7.2.1		50ø Class 6	m	1,875.00			
7.2.2		40ø Class 6	m	85.0			
7.2.3		32ø Class 6	m	470.0			
7.2.4		25ø Class 6	m	900.0			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.2.5		25ø Class 10	m	205.0			
7.3	8.2.5	**Supply and install medium class screwed galvanized iron pipes to SABS 62: 1971 in short cut lengths, including threading:**					
7.3.1		ø50	m	180.00			
7.3.2		ø40	m	40.00			
7.3.3		ø32	m	45.00			
7.3.4		ø25	m	15.00			
7.4	8.2.5	**Screwed malleable cast iron fittings to SABS 509-1955:**					
7.4.1		ø50mm elbows	No	6			
7.4.1		ø32mm elbows	No	4			
7.4.2		ø25mm elbows	No	15			
7.4.3		ø32mm unions	No	12			
7.4.4		ø25mm unions	No	17			
7.5	8.2.2	**"Duroflo" or similar approved cast iron fittings with sockets and rubber seals to SABS 966, packings, nuts and bolts:**					
7.5.1		200ø Flange adaptor drilled to SABS 1123 Table 1600/3	No	2			
7.5.2		110ø Flange adaptor drilled to SABS 1123 Table 1600/3	No	2			
7.5.3		90ø Flange adaptor drilled to SABS 1123 Table 1600/3	No	11			
7.5.4		200ø equal T piece	No	1			
7.5.5		160x110ø reducing T piece	No	4			
7.5.6		160x90ø reducing T piece	No	8			
7.5.7		160ø equal T piece	No	9			
7.5.8		75ø equal T piece	No	1			
7.5.9		160 x 80ø hydrant T piece	No	4			
7.5.10		90 x 75 reducing T	No	1			
7.5.10		75 x 63ø Reducing T	No	2			
7.5.11		200x160ø socketed reducer	No	3			
7.5.12		160x110ø socketed reducer	No	2			
7.5.13		160x90ø socketed reducer	No	3			
7.5.14		110x90ø socketed reducer	No	2			
7.5.15		75x63ø socketed reducer	No	1			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.6	8.2.2	**"Plasson" or similar approved pressure fittings and couplings.**					
7.6.1		ø50 dia elbows	No	24			
7.6.2		ø40 dia elbows	No	6			
7.6.3		ø32 dia elbows	No	2			
7.6.4		ø25 dia elbows	No	35			
7.6.5		50mm dia T piece	No	8			
7.6.6		32mm dia T piece	No	3			
7.6.7		50mm dia end cap	No	27			
7.6.8		50mm dia Flange adaptor to SABS 1123 Table 1600/3	No	2			
7.6.9		40mm dia Flange adaptor to SABS 1123 Table 1600/3	No	1			
7.6.10		50x40mm Reducer coupling	No	1			
7.6.11		50x32mm Reducer coupling	No	2			
7.6.12		50x25mm Reducer coupling	No	2			
7.6.13		32mmx1" 90° elbow with female offtake	No	112			
7.6.14		25mmx1" 90° elbow with female offtake	No	98			
7.6.13		50mmx1.5" T with male offtake	No	320			
7.6.15		32mmx1,5" Female adaptor	No	75			
7.6.16		25mmx1" Female adaptor	No	69			
7.6.17		90ø Plasson saddle with 50ø branch with pressure couplings for HDPe pipe.	No	15			
7.6.18		75ø Plasson saddle with 50ø branch with pressure couplings for HDPe pipe.	No	13			
7.6.19		75ø Plasson saddle with 32ø branch with pressure couplings for HDPe pipe.	No	8			
7.6.20		63ø Plasson saddle with 50ø branch with pressure couplings for HDPe pipe.	No	8			
7.6.21		50ø Plasson saddle with 25ø branch with pressure couplings for HDPe pipe.	No	3			
7.6.22		Connections of for new HDPe pipes to existing copper pipe connections:					
7.6.22.1		25ø HDPe to 15ø copper Plasson to Conex copression fitting	No	168			
7.6.22.2		32ø HDPe to 15ø copper Plasson to Conex copression fitting	No	12			
7.7		**Manufactured welded special pipe fittings:**					
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
	PSL.6, 8.2.5	*The following items are for welded manufactured steel pipe fittings to SABS 62 Medium Class or SABS 719 Grade B for pump stations, pipe bridges, connections to storage tanks and other locations on site, regardless of position, with "3M SchotchKote 162 PWX" or similar approved epoxy coating to 500µm coat thickness, enamel paint final coats, packings, bolts, nuts and trial assembly prior to final installation, completely installed (Alternatively Hot dip Galvanizing to SANS 121 on approval of by the Engineer)*					
7.7.1		Pipes in cut lengths for the following pipe diameters:					
7.7.1.1		200ø	m	5.8			
7.7.1.2		150ø	m	9.5			
7.7.1.3		100ø	m	22.0			
7.7.1.4		80ø	m	16.6			
7.7.1.5		65ø	m	7.0			
7.7.1.6		50ø	m	2.0			
7.7.1.7		40ø	m	5.0			
7.7.1.8		32ø	m	10.0			
7.7.2		Extra over for welded flanges to SABS 1123 Table 1600/3 including packings, bolts and nuts:					
7.7.2.1		200ø	No	10			
7.7.2.2		150ø	No	11			
7.7.2.3		100ø	No	26			
7.7.2.4		80ø	No	13			
7.7.2.5		65ø	No	18			
7.7.2.6		50ø	No	29			
7.7.2.7		40ø	No	5			
7.7.2.8		32ø	No	2			
7.7.3		Blank flanges to SABS 1123 Table 1600/3:					
7.7.3.1		200ø	No	2			
7.7.3.2		150ø	No	1			
7.7.3.3		65ø	No	1			
7.7.4		Extra over for welded T-piece branch intersections for the following diameters) (Branches measured under pipes) :					
7.7.4.1		200ø	No	1			
7.7.4.2		100ø	No	4			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.7.4.3		50ø	No	4			
7.7.5		Tapered reducers :					
7.7.5.1		150x200ø	No	1			
7.7.5.2		100x50ø	No	1			
7.7.5.3		80X65ø	No	1			
7.7.5.4		80x50ø	No	2			
7.7.5.5		65x50ø	No	2			
7.7.5.6		50x32ø	No	2			
7.7.6		Short radius bends for the following diameters:					
7.7.6.1		200ø	No	4			
7.7.6.2		150ø	No	4			
7.7.6.3		100ø	No	5			
7.7.6.4		65ø	No	3			
7.7.6.5		80ø	No	2			
7.7.6.6		50ø	No	3			
7.7.6.7		40ø	No	2			
7.7.7		Sundries items to welded steel fittings:					
7.7.7.1		50mm male screwed nipple	No	1			
7.7.7.2		32mm female screwed nipple	No	1			
7.7.7.3		15mm female screwed nipple	No	2			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.8		**"Klamflex"or similar approved couplings to suit plain ends for steel pipes of the following diameters:**					
7.8.1		100ø	No	2			
7.8.2		80ø	No	1			
7.8.3		50ø	No	2			
7.9	PSL.7, 8.2.5	**Special Fittings, valves, including packings, bolts and nuts, complete:**					
7.9.1		50mm flanged CI waterworks gate valve to SABS 664, right hand closing with hand wheel	No	8			
7.9.2		80mm flanged CI waterworks gate valve to SABS 664, right hand closing with hand wheel	No	1			
7.9.3		100mm flanged CI waterworks gate valve to SABS 664, right hand closing with hand wheel	No	1			
7.9.4		150mm flanged CI waterworks gate valve to SABS 664, right hand closing with hand wheel	No	1			
7.9.5		160mm CI waterworks gate valve to SABS 664, right hand closing with cap and sockets to SABS 966	No	3			
7.9.6		90mm CI waterworks gate valve to SABS 664, right hand closing with cap and sockets to SABS 966	No	3			
7.9.7		75mm CI waterworks gate valve to SABS 664, right hand closing with cap and sockets to SABS 966	No	2			
7.9.8		63mm CI waterworks gate valve to SABS 664, right hand closing with cap and sockets to SABS 966	No	1			
7.9.9		200mm "Teklflo" or similar gearbox wafer butterfly valve	No	1			
7.9.10		150mm "Teklflo" or similar gearbox wafer butterfly valve	No	1			
7.9.11		100mm "Teklflo" or similar gearbox wafer butterfly valve	No	1			
7.9.12		50mm flanged "KRVZ(A)-0050" or similar flanged slam proof check valve	No	2			
7.9.13		Meinecke Cosmos WPD DN50 flanged water meter with provision for electronic pulse take-off.	No	1			
7.9.14		50mm "Vent-O-Mat RPS" pressurized air release valve on 50ø GI pipe riser with 50ø Cobra brass gate valve	No	1			
7.9.15		100mm dia glycerine filled pressure gauges with -50 to 250 kPa range with 15mm stopcock	No	3			
7.9.16		100mm dia glycerine filled pressure gauges with -50 to 2000 kPa range with 15mm stopcock	No	1			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.9.17		50mm "Leveldex LD1601" float control valve with bend and strainer	No	1			
7.9.18		Ø40 1000kPa brass ball valve with copper ball to to suit ø40 Table 1600/3 flange	No	2			
7.9.20		50ø Cobra brass gate valve with Plasson compression fittings both ends to HDPe pipe	No	24			
7.9.21		32ø Cobra brass gate valve with Plasson compression fittings both ends to HDPe pipe	No	8			
7.9.22		25ø Cobra brass gate valve with Plasson compression fittings both ends to HDPe pipe	No	17			
7.10		**Concrete work and chambers for pipeline structures:**					
		The items below exclude pipes and fittings.					
7.10.1	PSL.8	Valve chambers with the following inside dimensions and cast iron covers to SABS 558, not deeper than 1.0m:					
7.10.1.1		450 x 450 with Type 14B cover.	No	5			
7.10.1.2		Extra over previous item for additional depth not exceeding 2,5m.	m	2.0			
7.10.1.3		450 x 600 with Type 14C cover.	No	2			
7.10.1.4		Extra over previous item for additional depth not exceeding 2,5m.	m	3.0			
7.10.1.5		600 x 900 with Type 14 C cover.	No	1			
7.10.1.6		Extra over previous item for additional depth not exceeding 2,5m.	m	1.0			
7.10.2		Extra over for increased size of manholes over and above the sizes specified above for:					
7.10.2.1		220mm brick walls, plastered both sides	m²	12.0			
7.10.2.2		125mm 25MPa floor slabs, including Ref 193 mesh and concrete	m²	6.0			
7.10.2.3		125mm 25MPa cover slabs, including Ref 193 mesh, edge and soffite shuttering and concrete	m²	6.0			
7.10.2.4		Valve box to SABS 1200 L Drawings L-1 with CI cover Type 3A to SABS 558	No	7			
7.10.2.5		Valve box with SABS 558 Type 11A CI 150x150 cover, 220x220x425 deep brick manhole with 50mm concrete floor	No	49			
7.10.2.6		Valve box with SABS 558 Type 11B CI 225x150 cover, 330x220x425 deep brick manhole with 50mm concrete floor	No	5			
7.11	PSL.2	**Prefabricated circular tank:**					
		(Foundations and earthworks measured elsewhere)					
7.11.1		Complete 260m³ circular tank	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
		Connecting pipework to tank:					
7.11.2		150ø scour outlet, flanged	No	1			
7.11.3		80ø flanged inlet both sides	No	2			
7.11.4		200ø fire outlet with vortex inhibitor (flanged)	No	1			
7.11.5		150ø overflow with insect proof gauze	No	1			
7.11.6		80ø outlet (flanged)	No	1			
		Tank appurtenances:					
7.11.7		Level indicator mechanism	Sum				
7.11.8		Access ladder inside	Sum				
7.11.9		Access ladder outside	Sum				
7.12		**Pump Installations:**					
		The prices below are for the complete supply, installation of the described equipment, including testing and commissioning					
7.12.1	PSL.3	Recirculation pump for underground tank:					
		(Pump No 1 on Schematic Layout Dwg No R01)					
7.12.1.1		Stainless steel submersible sump pumps with float switches and connecting pipework to 40ø delivery pipe	No				
7.12.1.2		Control panel	Sum				
7.12.1.3		Cabling for level switches in underground tank and pressure sensor in delivery pipe between U/G tank and new plant room (Distance 65m) (Ducts measured elsewhere)	Sum				
7.12.1.4		Testing and commissioning	Sum				
7.12.2	PSL.4	Fire booster pump:					
		(Pump No 3 on Schematic Layout Dwg No R01)					
7.12.2.1		Duty/ Standby fire pump set (Duty Point 550 kPa @ 42 lit/sec) with jockey pump, assembled on skids, including interconnecting, pipework, valves, non-return valves etc., ready to be connected to 2No ø100 suction flanges and ø200 delivery flange	Sum				
7.12.2.2		Control panels	Sum				
7.12.2.3		Electrical cabling, cable trays to pump sets from DB board 5m away in new plant room	Sum				
7.12.2.4		Testing of pump set and submission of test data	Sum				
7.12.2.5		Provisional sum for accommodation and travelling for the witnessing of pump tests by the Employer and Engineer	Sum	1		15,000	00
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.12.2.6		Charges, profit and mark-up on previous item	%	15,000.00			
7.12.2.7		Training of staff of the Employer in daily operation and routine maintenance	Sum				
7.12.2.8		Commissioning of pumps and hydrant system	Sum				
7.12.2.9		Provision of complete manuals an part lists for pump equipment	Sum				
7.12.2.10		Laminated and framed wall mounted diagrams of panel and pump installation	Sum				
7.12.2.11		Compilation and submission of comprehensive O&M schedule and training curriculum for hospital staff	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
7.12.3	PSL.5	Elevated tank feeder pumps:					
		(Pump No 2 on Schematic Layout Dwg No R01)					
7.12.3.1		Pump and motor set on frame (Duty Point 220 kPa @ 6.0 lit/sec)	No	2			
7.12.3.2		Control panel	Sum				
7.12.3.3		Electrical cabling, cable trays to pump sets from DB board 5m away in new plant room	Sum				
7.12.3.4		Sensor cables from elevated tank to control panel; in plant room (Ducting measured elsewhere)	Sum				
7.12.3.5		Testing of pumps and submission of test data	Sum				
7.12.3.6		Commissioning of pumps	Sum				
7.12.3.7		Training of staff of the Employer in daily operation and routine maintenance	Sum				
7.12.3.8		Provision of complete manual an part lists for pump equipment	Sum				
7.12.3.9		Laminated and framed wall mounted diagrams of panel and pump installation	Sum				
7.12.3.10		Compilation and submission of comprehensive O&M schedule and training curriculum for hospital staff	Sum				
7.13		**Hydrants and hydrant Reels:**					
7.13.1		Tamper-proof fire hydrant installation, complete with all pipework, ready to connect to CI fire-hydrant T-piece or flange adaptor , including packings, wrapped with Canuso Wrapid Bond tape around underground GI pipework, including painted concrete pedestal and painted	No	12			
7.13.2		65mm x 30m canvas Lay Flat hose with 65mm male and female instantaneous hose couplings	No	12			
7.13.3		"Woodlands" or similar hydrant cross key	No	12			
7.13.4		Woodlands or similar 65mm aluminium adjustable spray nozzle	No	6			
7.13.5		Wall mounted Glass reinforced fiber hydrant reel cabinets with break glass and key (each to house 60m of hydrant reel and nozzle)	No	3			
7.14		**Sundries:**					
7.14.1		Cut hole in existing sectional raw water galv steel tank, drill, apply Cold Galv and bitumen epoxy, fit 2 No ø40 screwed flanges for new additional inlet	Sum				
7.14.2	7.2	Pressure testing of new installations on site.	Sum				
7.14.3		Disinfection of new installations on site.	Sum				
Total Carried Forward To Summary							

Section 8: Bedding (Pipes)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200LB	**SECTION 8: BEDDING (PIPES)**					
8.1	8.2.1	**Provision of bedding from trench excavations.**					
8.1.1		Selected granular material.	m³	1,220			
8.1.2		Selected fill material.	m³	847			
8.2	8.2.2	**Supply of bedding by importation:**					
8.2.1		Selected granular material.	m³	215			
8.2.2		Selected fill material.	m³	149			
8.3	8.2.2.2	**Importation of bedding from commercial borrow pits:**					
8.3.1		Selected granular material. (PROVISIONAL)	m³	30			
8.3.2		Selected fill material. (PROVISIONAL)	m³	20			
8.3.3	8.2.4	Encasing of pipes in Class 15/19 concrete. (PROVISIONAL)	m³	21.0			
8.3.4	8.2.5	Overhaul further than 0,5km.	m³.km	560			
8.4		**Drainage of pipe trenches: (PROVISIONAL)**					
8.4.1		19mm Crushed stone in Geotextile in trench bottom as pioneer layer, 300mm thick	m³	60			
8.4.2		"Bidim A4 " geotextile lining for crushed stone.	m²	500			
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 LC	**SECTION 9: CABLE DUCTS**					
9.1	8.2.2 a)	Excavations:					
		Excavate in all materials for trenches, including selection of bedding from trenching or stockpiles elsewhere on site, backfilling, compaction to 95%, and disposal of surplus materials for the following trenches (importation or treating of bedding measured elsewhere):					
		for 300mm trench widths for the following depth categories:					
		Over Up to and including:					
9.1.1		400 800	m³	63.6			
	8.2.2 b)	Extra-over Item 8.2.2 a) above for:					
9.1.2		Intermediate excavations	m³	4.0			
9.1.3		Hard rock excavation	m³	2.0			
	8.2.6	**Extra over for treatment or importation of bedding:**					
9.1.4		Importation of bedding from stockpiles or other excavations on site, including transport within freehaul distance	m³	5.0			
9.1.5		Cement stabilization with 2 pocket of cement per m³	m³	2.0			
9.2	8.2.5	**Ducts & bends:**					
		Supply, lay, bed and proof the following "Kableflex" HDPe cable ducts and fittings, with couplings:					
9.2.1		75ø HDPe	m	65.0			
9.2.2		110ø HDPe	m	200.0			
9.2.3		75ø 45° pre-formed slow bend elbows	No	4			
9.2.4		110ø 45° pre-formed slow bend elbows	No	4			
9.3	8.2.7	**Draw pits and manholes:**					
9.3.1		600 L x 600 W x 1000 mm D manholes, including reinforcing, concrete, brickwork, plaster, waterproofing, etc. as detailed on drawings (ducts, manhole frames, cover and lid measured elsewhere)	No	2			
		Frames and cover for above:					
9.3.1.1		Aksess 700 / 677 x 676 / HD	No	2			
9.3.1.2		2170 / 8A / 450 x 600 / MD	No	2			
9.4	8.2.8	**Cable Markers and slabs:**					
Total Carried Forward							

Section 9: Cable Ducts

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
9.4.1		25MPa concrete cable markers, with 150x150 to 250x250 pyramid shaped, 300mm high with galvanised wire fastened to cable or cable duct and aluminium marker plate with inscription instructed by the Electrical Engineer	No	8			
9.4.2		25MPa 250 W x 500 L x 50mm T placed perpendicular across full width of trench, covering all sleeves and cables	No	265			
9.4.3		Skull and crossbones warning tape above services in trenches	m	265			
9.4.4		2mm² polyester draw tape	m	265.0			
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 LD	**SECTION 10: SEWERS**					
		The rates for the laying of sewers below apply to new sewers to be installed where none have been installed before and between new manholes, but may terminate against an existing manhole on the downstream end.					
10.1	8.2.1	**Supply, lay, joint on Class B bedding, complete with couplings, the following PVC sewers and test pipelines:**					
10.1.1		110ø dia Class 34	m	20.00			
10.1.2		160ø dia Class 34	m	660.0			
10.2	8.2.3, PSLD.1	**Manholes**:					
10.2.1		Manholes of brick or pre-cast ring in accordance with SABS 1200LD, Drawings LD-3, LD-4, LD-5 complete with Class C125 covers to SANS 1882, step irons and benching to the following depths:					
		Over Up to and including:					
10.2.1.1		0,0m 1,0m	No	1			
10.2.1.2		1,0m 1,5m	No	5			
10.2.1.3		1,5m 2,0m	No	2			
10.2.1.4		2,0m 2,5m	No	1			
10.2.1.5		Extra over for Class C250 heavy duty covers in roadways	No	1			
10.2.2	8.2.4	**Extra over manholes for up to the maximum invert height difference between inlet and channel invert for backdrops:**					
10.2.2.1		over 1.0m and up to 1.5m	No	1			
10.3		**Grease trap installation:**					
		(Refer to detail on drawings)					
10.3.1		Construct 550x1875x775 deep brick manhole with 150mm floor, 4.5mm galv steel checker floor plate cover with 40x5mm flatbar collar	No	2			
10.3.2		Install stainless steel grease traps supplied by hospital in manhole, bed in sand and connect to sewers	No	2			
10.4	BSG	**CCTV Sewer Survey:**					
10.4.1	BSG.11 a)	Site establishment and Preliminary and General Items	Sum				
10.4.2	BSG.11 b)	Internal Survey of Sewers, including pre-cleaning, with nominal diameters of:					
10.4.2.1		greater than 90mm and up to 125mm	m	100			
10.4.2.2		greater than 125mm and up to 200mm	m	3,100			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
10.4.3	BSG.11 c)	Cleaning of Sewers for access:					
		The cleaning below is only applicable upon instruction of the Engineer (Provisional)					
10.4.3.1		Provision of cleaning equipment for heavy cleaning	Sum				
10.4.3.2		Heavy cleaning of sewers	m	200			
10.4.4		Reporting:					
10.4.4.1		Updating of sewer "as-built" information	Sum				
10.4.4.2		Submission of survey in electronic format	Sum				
10.4.4.3		Submission of abbreviated hard-copy report with listing of defects and obstructions	Sum				
10.5	SABS1200 LD	**Repairs of existing sewers:**					
	PSLD	*The items below are for the replacement of existing sewers that have been identified to be installed incorrectly or with deficiencies or to carry out repair and connections to existing.*					
10.5.1	8.2.1	Supply, lay, joint on Class B bedding, in cut lengths, complete with couplings, the following PVC sewers in short lengths, including dismantling and removing of existing and sewer, and testing (Earthworks measured elsewhere):					
10.5.1.1		110ø dia Class 34	m	100			
10.5.1.2		160ø dia Class 34	m	240			
10.5.2		PVC double socket repair couplings for joining existing to new sewers (UK40) for the following nominal diameters					
10.5.2.1		110ø	No	50			
10.5.2.2		160ø	No	10			
10.5.3		Sundries PVC fittings:					
10.5.3.1		ø110 x 90° plain bends (UBR42)	No	6			
10.5.3.2		ø110 x 45° plain bends (UBR41)	No	4			
10.5.3.3		ø160 x 110 45° reducing junction with inspection eye (UYA63)	No	11			
10.5.4	PSLD.1	**Dealing with sewage flow during repairs:**					
10.5.4.1		Provision of pumping equipment	Sum				
10.5.4.2		Issue of CoC after completion of repairs and installations	Sum				
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS1200 LE	**SECTION 11: STORMWATER DRAINAGE**					
	8.2.1	**Supply and lay pipe culverts:**					
11.1		**Pre-cast concrete pipes with interlocking joints according to SABS 677 on Class B bedding:**					
11.1.1		225ø Class 50D, 1.22m long in fence stream crossings	No	30			
11.1.2		225ø Class 50D, 2.44m long in fence stream crossing	No	45			
11.1.3		375ø Class 100D	m	6			
11.1.4		450ø Class 100D	m	30			
11.2		Extra-Over Item 11.1 for cutting ends of pipes on site to suit manholes and wing walls**:**					
	8.2.4 a)	Straight cut for the following nominal diameters:					
11.2.1		375ø Class 50D	No	6			
11.2.2		450ø Class 100D	No	2			
11.3	8.2.7, PSLE.1	**Supply and Install Rocla pre-cast wing wall units for:**					
11.3.1		375ø pipe culverts, Type S1	No	3			
11.3.2		450ø pipe culverts, Type S1	No	2			
11.4		**Pre-cast channels:**					
11.4.1		Standard DPW pre-cast half round channels (Vanstone Type 8D or similar) , 115mm deep on 1:3 sand cement bed	m	120.0			
Total Carried Forward To Summary							

Section 12: Fencing

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	COLTO 5500	**SECTION 12: FENCING**					
		(Ref Dwg No E765/201)					
12.1		**Earthworks:**					
12.1.1		Excavation in all materials for fence poles and dispose by spreading and trimming	m^3	14			
12.1.2		Extra over Item 11.1.1 for intermediate material, including loading and disposal	m^3	3.5			
12.1.3		Extra over Item 11.1.1 for hard rock, including loading and disposal	m^3	1.4			
12.2	(LI)	**Concrete:**					
12.2.1		Class 15/19 concrete in pole bases, including 50mm permeable layer at bottom of base	m^3	13.2			
12.2.2		Class 20/19 concrete underdig strip 100mm wide x 200mm deep under fences, including excavations and shuttering in accordance with detail under vermin proof stock fence	m	123			
Total Carried Forward							

Section 12: Fencing

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
12.3	BSF	**New High-Security fencing:**					
		The rates below are fully inclusive for the completed fence. (Earthworks and concrete components are measured elsewhere.)					
		New 2.1m high galvanized steel with Marine Fusion Bond Coating high-security propriety fence with 2,7m high 85-45mm taper posts, 3.305x2.1m fence panel with 76.2x12.mm aperture size, of 3.0mm wire with V-bend horizontal reinforcing.					
12.3.1		Fence panels with posts	m	136.5			
12.3.2		Extra over for additional fence post on steep gradients and corners	No	7			
12.3.4		Extra over for cut panels shorter than 3.305m, including waste on steep gradients or on corners	m	6.6			
12.3.5		3.0x2.1m double leaf gate, including hinges, 90mm Diskus padlock and chain	No	1			
12.4		**High Security Sliding Gate:**					
		The gate below must be installed across the paver entrance road to the wastewater Treatment Plant					
12.4.1		Cut 300mm wide slot in existing 60mm interlocking pavers and kerbing and excavate 300mm deep for concrete rail base	m	7.0			
12.4.2		Cast 300x300 25MPa rail base with rail of R20 galv rod with R10 anchors 100mm long at 300c/c into concrete	m	12.0			
12.4.3		Complete 9.0m long x 2.1m High Security sliding gate with 100x75 RHS frame and fence mesh to match high-security fence panels, galvanized and marine fusion bonded, completely installed with roller wheels, guide structures and 90mm stainless steel disc lock	No	1			
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	SABS 1200 MJ	**SECTION 13: SEGMENTED PAVING**					
		The items below marked (LI) must be done in a labour intensive manner as described in the project specification.					
		Work scheduled under this section pertains to the repair of existing paving for road crossings and the relaying of paving taken up elsewhere.					
13.1		**Preparation:**					
13.1.1		Cut existing 60mm pavers prior to lifting	m	180.0			
13.1.2	LI	Carefully lift existing paving for road crossings and stockpile	m²	460.0			
13.1.3	LI	Lift existing Figure 3/14 kerbing combination and stockpile	m	150.0			
13.2	8.2.1	**Edge restraints:**					
13.2.1		Reinstall kerbing lifted under Item 13.1, including sand cement bed and jointing	m	150.0			
13.2.2		Extra over previous item, supply and deliver the following kerbing to replace broken kerbs:					
13.2.2.1		Figure 3	m	40.0			
13.2.2.2		Figure 4	m	40.0			
13.2.2.3		Install Fig 12 kerbs on side on 100mm Class 15/13 bedding to form edge restraint including sand cement bed	m	180.0			
13.3	PSMJ	**Construction of Paving Complete:**					
13.3.1	LI	Relaying of pavers from stockpiles, including sand bed	m²	460			
13.3.2	LI, 8.2.2	60mm Type S-A Class 30/2.0 non-textured grey interlocking concrete pavers in herringbone pattern on 20mm sand bed	m²	807			
13.3.3	LI, 8.2.2	60mm 200x100mm Type S-C Class 30/2.0 grey rectangular pavers on sand bed for walkway areas in decorative patterns	m²	50			
13.4		**Cutting Units to suit edge restraints:**					
13.4.1	8.2.3	Cutting of units to fit against kerbs, existing paving, borders, walls and other edge restraints and grouting up of small voids where necessary, regardless of curve or line	m	454			
13.4.2	8.2.4	Locking up of paving by rolling	m²	1,406			
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 1: WASTEWATER TREATMENT PLANT					
	BSA	**Installations:**					
		(The items below cover the completion and commissioning of the plant)					
1.1	BSA.4.1	Shop detaling and design	Sum				
1.2		**Air supply blowers:**					
1.2.1	BSA.5.9	Positive displacement blower sets with motors	No	2			
1.2.2	BSA.5.8	Control panel	Sum				
1.2.3	BSA.5.8	Electrical supply and cabling on cable trays between control panel and motors	Sum				
1.3	BSA.5.10	**Air Pipework :**					
		The items below are for Grade 316 austenitic Stainless steel pipework (screwed or welded), completely installed. The tenderer is required to confirm the pipe diameters . (Ref Dwg No E765-105)					
1.3.1		100dia main supply pipe	m	25.00			
1.3.2		Circular 100mm manifold loop on 2,5m radius with flanges to split in 3 sections and 12 No 50mm female screwed nipples for air take-offs. (The manifold can be made up of straight pipes with bends to approximate a circle)	Sum				
1.3.3		Complete 50mm dia diffuser dropper pipe assemblies with stop cocks, bends, unions, U bolt fixing clamps to 140mm taper flange support bracket and manifold for fitting of diffuser arrays, complete	No	10			
1.3.4		100mm elbow	No	8			
1.3.5		100mm equal T	No	1			
1.3.6		100x50mm T	No	2			
1.3.7		100mm gate valves	No	1			
1.3.8		50mm pipes for air lift, recycle etc.	m	12			
1.3.9		50mm elbows	No	12			
1.3.10		50mm gate valves	No	2			
1.3.11		100mm "VJ" type couplings"	No	2			
1.3.12		Connections to MLSS Recycle pipe	Sum				
1.3.13		Connection to RAS and sludge waste pipe (connection located underground on existing pipe)	Sum				
1.3.14		Stainless Steel holder bats to complete installation	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
1.3.15	BSA.5.11	Self cleaning polypropylene or ABS tube or disc diffusers (peak Oxygen requirement 17kgO2/hr complete with non-return valves	Sum				
		(state No of.....)					
1.3.16		100mm dia stainless steel glycerine filled pressure gauge with stopcock on header outlet of blowers	No	1			
1.3.17		100mm dia glycerine filled pressure gauge with stopcock on air supply manifold of reactor	No	1			
1.3.18		Pressure testing and certifications	Sum	1			
1.4		**Sundries Metalwork and Pipes:**					
		(Refer to Dwg No E765-105)					
1.4.1		Grade 316 Stainless Steel scum draw-off box with suspension rods and 60x60x5 support angles	Sum				
1.4.2		Grade 316 Stainless Steel Scum Baffle ring of 400x5mm plate with 2680mm diameter (8420mm circumference) with Stainless Steel suspension rods from floor structure	Sum				
		Fabricated Steel pipework:					
1.4.3		*Heavy Duty pipes to SABS 62 with flanges to SABS 1123 Table 600/3, galvanized 85um, including packings and stainless steel bolts*					
1.4.4		50mm bend, one end flanged	No	1			
1.4.5		50mm equal T, all ends flanged	No	1			
1.4.6		50mm pipe, both ends flanged, 1000mm long	No	1			
1.4.7		50mm straight pipe 1100mm long, one end flanged, with 25mm female nipple	No	1			
1.4.7		50mm straight pipe 2000mm long, one end flanged	No	1			
1.4.8		100mm equal T, all ends flanged	No	1			
1.4.9		100mm straight pipe 2000mm long, one end flanged	No	1			
1.4.10		Holder bats to compete the scum return pipe	Sum				
1.5	BSA.5.13	**Chlorine dosing :**					
1.5.1		Electrical control systems required for the effective operation of the chlorine dosing station.	Sum				
1.5.2		Chlorine dosing system complete with control accessories and mountings.	Sum				
1.5.3		Chlorine mixing tank (consisting of two interconnected tanks) complete with water supply and waste discharge piping.	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
1.5.4		Tank mounted mixer in chlorine mixing tank complete with all electrical supply requirements and control system.	Sum				
1.6	BSA.7	**Flow metering :**					
1.6.1		Sharp Crested weir in chlorine contact channel (750mm width available) of 3CR12 with low level V-notch	Sum				
1.6.2		Ultrasonic flow meter sensor with mountings.	Sum				
1.6.3		Data logger with digital readout mounted inside chlorine hut, including cabling in MS GI duct (3.0m) long	Sum				
1.6.4		"sca::n" or similar Free Chlorine Sensor in chlorine contact channel	Sum				
1.6.5		"sca::n" drinking water monitoring station mounted in chlorine hut, including sensor cabling (3,0m long) in galv MS duct	Sum				
1.6.6		Software and licensing, cabling and training of Engineer and Employer Staff	Sum				
1.6.7		Preparation for remote monitoring and data transfer	Sum				
1.7	BSA.12, BSA.13	**Commissioning:**					
		The items below are for the work required to commission the plant, including increase frequency of testing, making adjustments to the plant, training, manuals etc.					
1.7.1	BSA.12	Commissioning and operation of the works for 90 days or to the date at which compliance of the effluent is reached (the later date applies), including tests and reporting.	Sum				
1.7.2	BSA.14, BSW.14	On site training of operators provided by the Client.	Sum				
1.7.3	BSA.9	Operation, maintenance and spares manual by the process designer, to be updated at the completion of the O&M period	Sum				
1.7.4	BSA.11.5	Laminated wall mounted wiring diagrams and operating instructions.	Sum				
1.7.5	BSA.11.5	Indicator plates, labelling and signposting	Sum				
1.7.6	BSA.13	Sampling, testing and reporting to during Commissioning period	Sum				
1.7.7		Other Items not specified to comply with specifications and requirements	Sum				
Total Carried Forward To Summary							

Section 2: Water Purification Plant

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 2: WATER PURIFICATION PLANT					
2.1	BSW	**Installation:**					
		(The items below collectively cover the design, assembly, delivery, installation and commissioning of the plant with a 15m³/h capacity)					
2.1.1		Flocculation system, chemical dosing and pH correction	Sum				
2.1.2		Sedimentation system, including sludge discharge control and pipework up to sludge waste manhole (5m distance max)	Sum				
2.1.3		Filtration stages, including backwashing system and media cleaning systems	Sum				
		Any further system not specified, but required, e.g. RO filtration etc. (Tenderer to specify):					
2.1.4		.....	Sum				
2.1.5		.....	Sum				
2.1.6		.....	Sum				
2.1.7		Disinfection system, including chemical dosing set, mixing, storage and electrical components and controls	Sum				
2.1.8		pH control system of purified water	Sum				
2.1.9		WPP pump sets, level control and control panels	Sum				
2.1.10		Electronic and electrical control systems, sensors, cabling and ducting	Sum				
2.1.11		Watermeter, pipework, valves and pipe fittings	Sum				
2.1.12		Plant connections to supply and delivery flanges	Sum	1.0			
2.1.13	BSW.11	Roofing over plant (if required)	Sum	1.0			
2.1.14	BSW.10, BSW.11	Additional building and civil works not provided by the Employer (Contractor to specify) :					
		The tenderer must specify any additional Civils or building components required over and above those scheduled elsewhere.					
2.1.14.1		....	Sum				
2.1.14.2		....	Sum				
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
2.1.14.3		....	Sum				
2.1.15		Design and shop detailing	Sum				
2.1.16		Provisional sum for evaluation of plant for travelling and accommodation for the pre-delivery inspection of equipment by the Employer/ and or the Engineer	Sum			25,000	00
2.1.17		% Profit on previous item to cover overheads and cost.	%	25,000.00			
2.2	BSW	**Commissioning:**					
2.2.1	BSW.13	Commissioning of plant, including initial chemical testing and chemicals for 1 month of water production	Sum				
2.2.2	BSA.9	Development and submission of operation maintenance and spares manual (4 copies).	Sum				
2.2.3	BSA.9	Wall mounted wiring diagrams, system diagrams and operating instructions (Laminated, printed with UV and fade proof ink)	Sum	1.0			
2.2.4	BSW.14	On site training of operators provided by the Client.	Sum				
2.2.5		Provision for the application for Water Use Licence for the plant.	Sum	1.00		16,500	00
2.2.6		% Profit on previous item to cover overheads and cost.	%	16,500.00			
2.2.7		Operation of the works during the Construction period (excluding chemicals)	Sum				
2.2.8	BSW.15	Monthly reports after successful commissioning during Construction Period, including laboratory testing	Sum	1			
2.2.9		Supply of equipment and chemicals					
	BSW.19	Supply of protective clothing and equipment for the normal operating activities associated with the works:					
2.2.9.1		Overalls	No	4			
2.2.9.2		Gloves	No	8			
2.2.9.3		Pairs of gum boots	No	4			
2.2.9.4		Pairs of safety work boots	No	4			
2.2.9.5		Safety equipment	sets	4			
	BSW.19	Supply equipment to operate the potable water treatment works:					
2.2.9.6		Bucket	Sum	3			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
2.2.9.7		Dust bins	Sum	3			
2.2.9.8		Set of garden tools	Sum	1			
2.2.9.9		Pool skimming net on 5m pole	No	4			
		Supply of other equipment required to operate the plant not specified (Contractor to state)					
2.2.9.10		.....	Sum				
2.2.9.11		.....	Sum				
2.2.9.10		.....	Sum				
2.2.9.11		Petrol driven bush cutter (Stihl FS120 1,3kW)	Sum	1			
2.2.9.12	BSW.16	Chemicals:					
2.2.9.13		Supply of of chemicals and other consumables during the Construction Period at agreed dosage rates	Sum	360,000.00		360,000	00
2.2.9.14		% Profit on previous item to cover overheads and other costs	%	360,000.00			
2.2.10	BSW.18	Supply of monitoring equipment for site evaluation of the potable water quality:					
2.2.10.1		pH meter inclusive of electrode, 3 buffer solutions and 5 250 ml plastic beakers	No	1			
2.2.10.2		Hach turbidity meter and sample cuvette and standard solutions	No	1			
2.2.10.3		Colorimetric chlorine test equipment and reagents to test 300 samples	No	1			
2.2.11		Training of operators in the correct use of the test equipment.	Sum				
Total Carried Forward To Summary							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
	BSB	**SECTION 3 : OPERATION AND MAINTENANCE**					
		(The Items below collectively cover the Operations and Maintenance of systems, plant, and equipment commissioned under this Contract and for the duration of the O&M period. Also refer to P&G Items scheduled)					
3.1	BSB.2	**General:**					
		Oversight, minimum fortnightly site visits, costs and overheads	month	24			
		Ongoing training	month	24			
		Monthly reports (combined)	month	24			
3.2		**Sewage Treatment Plant:**					
3.2.1		All costs, mark-ups and profit to operate and maintain the plant	month	24			
3.2.2		Normal and scheduled spares and servicing of equipment	month				
3.2.3		Final servicing of plant at end of Operations and Maintenance Period	Sum				
3.2.4		Provision of final set of consumables, spares and whearing parts for one year scheduled maintenance, like,oil, filters, drive belts, at least 25% of bubble diffusers installed etc.	Sum				
3.2.5		Sampling and laboratory testing (Monthly intervals)	month	24			
3.3		**Water Purification Plant:**					
3.3.1		All costs, mark-ups and profit to operate and maintain the plant	month	24			
3.3.2		Normal and scheduled spares and servicing of equipment	month				
3.3.3		Final servicing of plant at end of Operations and Maintenance Period	Sum				
3.3.4		Provision of final set of consumables, spares and wearing parts, seals, gaskets for one year scheduled maintenance, like filter elements, RO membrane elements etc.	Sum				
3.3.5		Sampling and laboratory testing (fortnightly)	month	24.0			
3.4		**Dam pump station (existing):**					
3.4.1		All costs, mark-ups and profit to operate and maintain the plant	month	24			
	BSB.6	**Operate and Maintain installations completed by Civil (Principal) Contractor:**					
3.5		Submersible raw water pump set (0.75kW (Pump 1):					
3.5.1		All costs, mark-ups and profit to operate and maintain the pumps set (duty/ stby)	month	24			
Total Carried Forward							

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
3.5.2		Normal and scheduled spares and servicing of equipment	month				
3.5.3		Final servicing of equipment at end of Operations and Maintenance Period	Sum				
3.6		Domestic supply pump set ± 2.2kW (Pump 2):					
3.6.1		All costs, mark-ups and profit to operate and maintain the pump set (duty/ stby)	month	24			
3.6.2		Normal and scheduled spares and servicing of equipment	month				
3.6.3		Final servicing of equipment at end of Operations and Maintenance Period	Sum				
3.7		Fire Booster Pump Set (Pump 3):					
3.7.1		All costs, mark-ups and profit to test and maintain the pumps set (duty = electric/ diesel = stby + electric jockey pump)	month	24			
3.7.2		Normal and scheduled spares and servicing of equipment	month				
3.7.3		Final servicing of equipment at end of Operations and Maintenance Period	Sum				
3.7.4		Provision of final set of consumables, spares and wearing parts for one year scheduled maintenance, like filter elements, seals, gaskets, oil, grease etc.	Sum				
3.8	BSB.6	Buildings etc:					
		Maintain buildings and other installations as listed, general house keeping, including final making good and painting to "as new" state before Final Completion	month	24.0			
3.9	BSB.8	**Chemicals:**					
3.9.1		Supply, storage and dosing of chemicals and other consumables during the Construction Period at agreed dosage rates	Sum	2,000,000.00		2,000,000	00
3.9.2		% Profit on previous item to cover overheads and other costs	%	2,000,000.00			
Total Carried Forward To Summary							

Tafalofefe Hospital: Infrastructure Completion

Schedule 4: Electrical and Controls

PRELIMINARY AND GENERAL

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 A, PSA	**SECTION 1: PRELIMINARY AND GENERAL**				
4.1	8.3	**Fixed charge items:**				
		For the Construction Period:				
4.1.1	8.3.1 8.3.2, PS6, PS7	Contractual requirements **Establish of Facilities on the Site:**	Sum	1.00		
4.1.3	8.3.2.2, PS7.1	*Facilities for the Contractor:*				
4.1.3.1		a) Offices and storage sheds	Sum	1.00		
4.1.3.2		b) Workshops	Sum			
4.1.3.3	8.3.2.2 c), PSA.2	c) Laboratories and quality control	Sum	1.00		
4.1.3.4		d) Living accommodation	Sum			
4.1.3.5		e) Ablution and latrine facilities	Sum	1.00		
4.1.3.6		f) Tools and equipment	Sum	1.00		
4.1.3.7		g) Water supplies, electric power and communications	Sum	1.00		
4.1.4	8.3.3	Further fixed-charged obligations:				
4.1.4.1		Other fixed-charged obligations	Sum	1.00		
4.1.5	8.3.4	Removal of site establishment	Sum	1.00		
4.1.6	BSB	For the Operation and Maintenance Period:				
4.1.6.1		Contractual requirements	Sum	1.00		
4.1.6.2		Other fixed-charged obligations:	Sum	1.00		
4.1.6.3		Compliance with Construction Occupational Health and Safety Regulations	Sum	1.00		
4.1.7	8.4, PSA.3	**Time-related items:**				
		For the Construction Period:				
4.1.7.1	8.4.1	Contractual requirements	Sum	1.00		
	8.4.2	**Operations and Maintenance of Facilities on Site for Duration of Construction:**				
4.1.7.3	8.4.2.2	*Facilities for Contractor, Except where otherwise stated:*				
4.1.7.3.1		a) Offices and storage sheds	Sum	1.00		
4.1.7.3.2		b) Workshops	Sum	1.00		
4.1.7.3.3	8.4.2.2, PSA.2	c) Laboratories and quality control	Sum	1.00		
4.1.7.3.4		d) Living Accommodation	Sum	1.00		
Total Carried Forward						

Tafalofefe Hospital: Infrastructure Completion

Schedule 4: Preliminary Sections

PRELIMINARY AND GENERAL

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
4.1.7.3.5		e) Ablution and latrine facilities	Sum	1.00		
4.1.7.3.6		f) Tools and equipment	Sum	1.00		
4.1.7.3.7		g) Water supplies, electric power and communications	Sum	1.00		
4.1.7.4	8.4.3	Supervision for duration of construction.	Sum	1.00		
4.1.7.5	8.4.4	Company and head office overhead for the duration of the contract.	Sum	1.00		
4.1.7.6	8.4.5	Other time-related obligations	Sum	1.00		
	BSB	For the Operation and Maintenance Period:				
4.1.7.7		Supervision and management	Sum	1.00		
4.1.7.8		Company and head office overheads	Sum	1.00		
4.1.7.9		Other time-related obligations	Sum	1.00		
4.1.7.10		Compliance with Construction Occupational Health and Safety Regulations	Sum	1.00		
4.1.8	8.5	**Provisional Sums:**				
4.1.8.1		Allow the sum of R150,000.00 for the tracing of all underground cables including all the equipment necessary to locate cables, GPS all points, produce CAD drawing, liaise with supply authority and provide personnel with authority to operate HV plant	Sum	1.00	150 000.00	150 000.00
4.1.8.2		Allow for profit	%			
4.1.8.3		Allow for attendance	%			
Total Carried Forward To Summary						

Tafalofefe Hospital: Infrastructure Completion
Schedule 4: Electrical and Controls
FIELD INSTRUMENTATION (FI)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.2	**E2.1.1**	**FIELD INSTRUMENTATION (FI)**				
4.2.1		Supply and Install reactor and clarifier hydrostatic level measurement instrument water level sensors c/w sensor cable to the motor control centre and mounting brackets to ensure complete installation as detailed in specification and drawings.				
		Supply	No.	2		
		Install	No.	2		
4.2.2		Supply and install oxygen demand sensor complete with it's own sensor cable to the motor control and mounting brackets as detailed in specification and drawings.				
		Supply	No.	2		
		Install	No.	2		
4.2.3		Supply and install flow sensor c/w communication cable from the outlet and in let flows as detailed in the specification				
		Supply	No.	7		
		Install	No.	7		
4.2.4		Supply and install IP65 limit switches complete with valve mounting brackets and communication cable to the control panel. These must be priced as a complete set for each valve.				
		Supply	No.	16		
		Install	No.	16		
4.2.5		Supply and install point level float switch c/w communication cable and mounting brackets as detailed in specification and drawings.				
		Supply	No.	10		
		Install	No.	10		
4.2.6		Supply and install pressure sensor c/w sensor cable and all other necessary accessories to complete the installation				
		Supply	No.	6		
		Install	No.	6		
4.2.7		Supply and Install multicore communication cable to extract data from the package treatment plant field equipment and other filed instruments.				
		Supply	m	350		
		Install	m	350		
		CARRIED FORWARD TO SUMMARY PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.3		**MOTOR CONTROLS AND COMMUNICATION**				
		MOTOR CONTROL CENTRE (MCC)				
4.3.1	E2.1.1	Supply, install and commission MCC for 5.5kW waste water blower motors complete with relay logic (refer to CAR18-1807E-001 and CAR18-1807E-002), variable speed drive, meters, switchgear and all other accessories to complete the installation as per project specification and drawings. Supply Install	sum	1		
4.3.3	E2.1.1	Supply, install and commission MCC for 3kW booster, 50kW fire pump, 10kW water treatment and 5kW back wash motors complete with relay logic (refer to (refer to CAR18-1807E-001 and CAR18-1807E-002), each motor shall be on variable speed drive, meters, switchgear and all other accessories to complete the installation as per project specification and drawings. Supply Install	sum	1		
4.3.4	E2.1.1	Supply, install and commission MCC for 0.2kW submersible (jockey pump) motor complete with relay logic (refer to (refer to CAR18-1807E-001 and CAR18-1807E-002), direct online starter, meter switchgear and all other accessories to complete the installation as per project specification and drawings. Supply Install	sum	1		
		COMMUNICATION				
4.3.5	E2.1.17 E2.1.19	Supply and install wall mounted 3CR12 Radio Telemetry Panel for the waste water blower room (similar to the panel at the raw water), complete with radio interfaces to link to the SCADA system in Control Room (master station). This should accommodate all the blower room inputs and outputs as indicated in the block diagram Supply Install	sum	1		
4.3.6	E2.1.17 E2.1.19	Supply and install wall mounted 3CR12 radio telemetry panel (master station) complete with telemetry equipment, interfaces(including antenna) to link to the blower and raw water out stations thereafter relay data to the SCADA. Supply Install	sum	1		
		CARRIED FORWARD TO SUMMARY PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		Brought Forward				
4.3.7	E2.1.17 E2.1.19	Supply and install optic fibre communication cable to link the master station to the SCADA system (control room) c/w special fibre terminations				
		Supply	m	200		
		Install	m	200		
4.3.8	E2.1.17 E2.1.19	Supply and install complete PC based SCADA Control/mimic/alarm system complete with operator console with inputs from controls/radio telemetry. (Allow here also for high spec computer and 3kVA UPS and wall mounted flashing light and audible alarm for urgent selected alarms).	sum	1		
		Supply				
		Install				
4.3.9	E2.1.17 E2.1.19	Supply and install pilot cables from pressure, temperature, level, flow and other transducers / sensors to be terminated in the control Junction panel and then extended to control and alarm panels on the LV switch-board via multicore cable. Allow here also for power cabling to all the filed instruments in pumpstations.	sum	1		
		Supply				
		Install				
4.3.10	E2.1.17 E2.1.19	Supply and install 32 inch commercial monitors c/w with accessories such as HDMI and other accessories				
		Supply	No	2		
		Install	No	2		
		CARRIED FORWARD TO SUMMARY PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.4	**E2.1.5**	**CABLES, TRENCHES AND CABLE TRAYS**				
		CABLES				
4.4.1		Supply and install 120 mm² 4-core Cu SWA PVC 600V / 1000V Cable c/w terminations as per project specification and drawings				
		Supply	m	200		
		Install	m	200		
4.4.2		Supply and install from 70mm² 4-core Cu SWA PVC 600V / 1000V Cable c/w terminations as per project specification and drawings				
		Supply	m	300		
		Install	m	300		
4.4.3		Supply and install from 50 mm² 4-core Cu SWA PVC 600V / 1000V Cable c/w terminations as per project specification and drawings				
		Supply	m	150		
		Install	m	150		
4.4.4		Supply and install from 25 mm² 4-core Cu SWA PVC 600V / 1000V Cable c/w terminations as per project specification and drawings				
		Supply	m	100		
		Install	m	100		
4.4.5		Supply and install 6 mm² 4-core Cu SWA PVC 600V / 1000V Cable c/w terminations as per project specification and drawings				
		Supply	m	350		
		Install	m	350		
4.4.6		Supply and install 4 mm² 4-core Cu SWA PVC 600V / 1000V Cable c/w terminations as per project specification and drawings				
		Supply	m	200		
		Install	m	200		
4.4.7		Supply and install 120 mm² bare copper earth conductor c/w terminations as per project specification and drawings				
		Supply	m	200		
		Install	m	200		
4.4.8		Supply and install 70 mm² bare copper earth conductor c/w terminations as per project specification and drawings				
		Supply	m	180		
		Install	m	180		
		CARRIED FORWARD TO NEXT PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		Brought Forward				
4.4.9		Supply and install 50 mm² bare copper earth conductor c/w terminations as per project specification and drawings				
		Supply	m	200		
		Install	m	200		
4.4.10		Supply and install 25 mm² bare copper earth conductor c/w terminations as per project specification and drawings				
		Supply	m	100		
		Install	m	100		
4.4.11		Supply and install 6 mm² bare copper earth conductor c/w terminations as per project specification and drawings				
		Supply	m	150		
		Install	m	150		
4.4.12		Supply and install 4 mm² bare copper earth conductor c/w terminations as per project specification and drawings				
		Supply	m	200		
		Install	m	200		
4.4.13		Supply and install concrete cable markers as per project specification	sum	1		
		TRENCHES (450mm wide x 600mm deep)				
4.4.14		Excavate in normal to pickable shale type soil, price to include bedding and backfilling as per project specification	m³	148.50		
4.4.15		Excavate in soft rock (compressor required), price to include bedding and backfilling as per project specification	m³	89.10		
4.4.16		Excavate in hard rock(drilling machine required), price to include bedding and backfilling as per project specification	m³	59.40		
4.4.17		Supply and install 900 x 900 x 600 deep manholes complete with heavy duty cover plates				
		Supply	No.	6		
		Install	No.	6		
4.4.18		CABLE TRAY The price must shall include clamps, bends and all other necessary accessories to complete the installation as per specification				
4.4.19		76mm medium duty cable tray				
		Supply	m	200		
		Install	m	200		
4.4.20		152mm medium duty cable tray				
		Supply	m	100		
		Install	m	100		
		CARRIED FORWARD TO SUMMARY PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.5		**LUMINAIRES, WIRING, CONDUITS AND ACCESSORIES**				
	E2.1.15	LUMINAIRES				
4.5.1		Supply and install Type A				
		Supply	No	7		
		Install	No	7		
4.5.2		Supply and install Type B				
		Supply	No	6		
		Install	No	6		
4.5.3		Supply and install Type C				
		Supply	No	6		
		Install	No	6		
4.5.4		Supply and install Type D				
		Supply	No	20		
		Install	No	20		
	E2.2.4.22	WIRING, CONDUITS AND ACCESSORIES				
4.5.5		Supply and install photo cell in an empty luminaire as detailed in specification				
		Supply	No	7		
		Install	No	7		
4.5.6		Supply and install 2,5mm² PVC black & red				
		Supply	m	540		
		Install	m	540		
4.5.7		2,5mm² PVC green/yellow earth wire				
		Supply	m	330		
		Install	m	330		
4.5.8		Supply and install 4mm² PVC black & red				
		Supply	m	210		
		Install	m	210		
4.5.9		Supply and install 20mm diameter plain galvanised steel conduit c/w fixing material and all other accessories necessary to complete installation				
		Supply	m	320		
		Install	m	320		
4.5.10		Supply and install 25mm diameter plain galvanised steel conduit c/w fixing material and all other accessories necessary to complete installation				
		Supply	m	110		
		Install	m	110		
4.5.11		Supply and install lightweight round shallow back or side entry type for 20mm dia conduit on surface in open roof space and built into wall averaged for 1,2,3 and 4 ways				
		Supply	m	40		
		Install	m	40		
		CARRIED FORWARD TO NEXT PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		Brought Forward				
4.5.12		Supply and install lightweight round shallow back or side entry type for 25mm dia conduit on surface in open roof space and built into wall averaged for 1,2,3 and 4 ways				
		Supply	No	25		
		Install	No	25		
4.5.14		Supply and install galvanised bosal, 100 x 50 x 50 switch boxes for 20mm dia conduit built into brickwork or cast into concrete (cover plates measured elsewhere)				
		Supply	No	10		
		Install	No	10		
4.5.14		Supply and install galvanised bosal, 100 x 100 x 50 switch boxes for 20mm dia conduit built into brickwork or cast into concrete (cover plates measured elsewhere)				
		Supply	No	10		
		Install	No	10		
4.5.16		16 amp two lever, one way flush mounted rocker type light switch with cover plate.				
		Supply	No	5		
		Install	No	5		
4.5.17		16A single socket-outlet complete with socket-outlet complying to SANS 164-2(euro plug with earth) and cover plates				
		Supply	No	10		
		Install	No	10		
4.5.18		Supply and install IP 67, 63A 3-phase welding socket outlet complete with all accessories as per positions indicated on drawings				
		Supply	No	3		
		Install	No	3		
		CARRIED FORWARD TO SUMMARY PAGE				

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.6	E2.1.3	**LIGHTNING PROTECTION**				
		Lightning protection system to SANS Code of Practice 10313 as amended used in conjunction with SANS 62305 and all other applicable standards. The Contractor to employ lightning protection specialist for the complete supply and installation of the system.				
4.6.1		Supply and install 8mm (ø) diameter round aluminium roof conductor c/w roof conductor holders.				
		Supply	m	150		
		Install	m	150		
4.6.2		Supply and install 100mm x 100mm test joint box c/w with aluminium cover plate indicating date of installation.				
		Supply	No	10		
		Install	No	10		
4.6.3		Test joint bi-metallic connector c/w test joint number plate.				
		Supply	No	10		
		Install	No	10		
4.6.4		Supply and install 50mm^2 PVC insulated copper conductor installed as shown on drawings.				
		Supply	m	100		
		Install	m	100		
4.6.5		Supply and install 2.5m length 15mm (ø) diameter copper earth electrode c/w copper clamps and electrode couplers. The electrode will be driven to the ground at 500mm below the ground				
		Supply	No	15		
		Install	No	15		
4.6.6		Testing of complete installation in terms of the regulations	Sum	1		
4.6.7		Provide Safety Report by Specialist	sum	1		
4.6.8		Provide as-built drawings and documentation	sum	1		
		CARRIED FORWARD TO SUMMARY PAGE				

Tafalofefe Hospital: Infrastructure Completion
Schedule 4: Electrical and Controls
STANDBY GENERATOR SET

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.7		**STANDBY GENERATOR SET**				
4.7.1	1. 2.1. 2.2. 2.3. 3.	Supply, deliver and install 66kVA open generator c/w alternator, fire extinguishing, control panel (ATS), et cetera as detailed in the generator specification c/w 100A breaker	sum	1		
4.7.2		Supply and Install main switch panel in the LV room to link the genset to the existing installation as detailed in the single line diagrams. CAR18-1807E-002	sum	1		
4.7.3	2.3.9	Supply and install generator set earthing system as specified	sum	1		
4.7.4	2.5.	Supply and install set of Warning Notices as per SANS and OHS specifications	sum	1		
4.7.5	1.6.	Test and Commission the generator set at the supplier's premises before delivered to site. Include travelling costs for two (2) of client representatives from East London including flights and accommodation	sum	1		
4.7.6	1.6.	Test and Commission the generator set by the supplier on site	sum	1		
4.7.7	1.7.	Compilation of Maintenance, Operational and Technical Manuals to the clint's satisfaction	No	3		
4.7.8		Price to fill up diesel tank after commissioning	sum	1		
4.7.9	1.8.	12 Month maintenance as per the specification. Quarterly (4) service of the plant as per the manufacturer's requirements.	sum	1		
4.7.10		Allow for Operational maintenance of the generator set, during a period of 24 months, including quarterly (4) service of the plant as per the manufacturer's requirements.	sum	1		
		CARRIED FORWARD TO SUMMARY PAGE				

Tafalofefe Hospital: Infrastructure Completion
Schedule 4: Electrical and Controls
CLOSED CIRCUIT TELEVISION (CCTV)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.8		CLOSED CIRCUIT TELEVISION (CCTV)				
4.8.1		Supply and install wall mounted 24U equipment cabinet cover plates and rails etc				
		Supply	No	2		
		Install	No	2		
4.8.2	E3.2.2.7	Network video recorder for up to 32 channels, c/w expandable ram and enough hard drive storage for up to 90 days and provide full resolution	sum	2		
4.8.3	E3.2.2.8	24 port 10/100/1000 ethernet switch (PoE) c/w network and fibre modules as required , patch panels and brush panels (provide full resolution)				
		Supply	No	2		
		Install	No	2		
4.8.4	E3.2.2.3	Supply and install 3kVA UPS c/w with batteries for up to 30 minutes				
		Supply	No	2		
		Install	No	2		
4.8.5	E3.2.2.2	Supply and install a robust rackmounted workstation host PC, Intel Core i7, Windows 10 64bit, Dual 256bit Display, 1TB OS, 8GB Ram, Keyboard & Mouse or similar approved.				
		Supply	No	1		
		Install	No	1		
4.8.6	E3.2.2.9	Supply and install 8 Port Gigabit PoE Smart Switch, 2 x SFP slots for Fiber Gigabit Ethernet Modules.(8 x PoE Ports / 46W) or similar approved.				
		Supply	No	1		
		Install	No	1		
4.8.7	E3.2.2.6	Supply and install 32 inch commercial monitors c/w with accessories such as HDMI and other accessories				
		Supply	No	1		
		Install	No	1		
4.8.8	E3.2.2.5	Supply and install Type A cameras				
		Supply	No	5		
		Install	No	5		
4.8.9	E3.2.2.5	Supply and install Type B cameras				
		Supply	No	5		
		Install	No	5		
4.8.10	E3.2.2.5	Supply and install Type C cameras				
		Supply	No	6		
		Install	No	6		
		CARRIED FORWARD TO NEXT PAGE				

Tafalofefe Hospital: Infrastructure Completion
Schedule 4: Electrical and Controls
CLOSED CIRCUIT TELEVISION (CCTV)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		Brought Forward				
4.8.11	E3.2.2.1 E3.2.2.2	Surveillance software, commission and ensure remote access by the user client representatives	sum	1		
4.8.12	E3.3.5	Support and maintenance for 12 months period	sum	1		
4.8.13	E3.2.1.4	Supply and install Cat 6 STP cable Supply Install	 m m	 150 150		
4.8.14	E3.3.	Allow for Testing and commissioning of complete system in terms of regulations	sum	1		
4.8.15	E3.3.4	Allow for training of staff and relevant personnel for a period of 8 full hours	sum	1		
4.8.16		Supply and Install complete communications media between Raw Water Station CCTV equipment and the master station server and NVR, including appropriate antennae equipment and radio transmission equipment, complete with terminations and accessories.	sum	1		
		CARRIED FORWARD TO SUMMARY PAGE				

Tafalofefe Hospital: Infrastructure Completion
Schedule 4: Electrical and Controls
MISCELLANEOUS / SUNDRY ITEMS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
4.9		MISCELLANEOUS / SUNDRY ITEMS				
4.9.1		Provision of training to person(s) responsible for the operation and maintenance of the plant as detailed in the specification for a period equivalent to 8hrs. Price to include all documentation to ensure proper training to selected personnel.	sum	1		
4.9.2		Allow for testing of the entire installation and provision of completion certificates, test results and COC's.	sum	1		
4.9.3		Provision of three(3) sets of Operating instructions and maintenance manuals as per specification	sum	1		
4.9.4		Provide portable fire extinguishers complete with mounting bracket and cupboard where required as detailed in the specification	sum	1		
4.9.5		Allow for testing of equipment (MCC) at manufactures premises and submission of results. Price to include travelling, accommodation and subsistence of the client representative and engineer to witness tests at manufacture's premises. Travelling arrangement and payments to be made by the contractor.	sum	1		
4.9.6		Provide "As Built" drawings	sum	1		
4.9.7		12 months Defects liability period commitment inclusive of labour, travelling, subsistence, materials, testing, etc as specified	sum	1		
4.9.8		Supply and install labelling for Cables, Distribution boards, dedicated & normal socket outlets, isolators, light switches with durable text that can only be removed by deliberate & determined action. Required text on labelling shall be as shown on drawing	sum	1		
		Rates for additional labour not covered in this bill:				
4.9.9		1) accredited registered person- normal time	/hr	10		
4.9.10		II) accredited registered person- over time	/hr	10		
4.9.11		III) qualified artisan - normal time	/hr	10		
4.9.12		IV) qualified artisan - over time	/hr	10		
4.9.13		V) semi skilled - normal time	/hr	10		
		Operation and Maintenance Costs for the entire installation				
4.9.14		All costs, mark-ups and profit to operate and maintain the plant	month	24		
4.9.15		Normal and scheduled spares and servicing of equipment	month	24		
4.9.16		Final servicing of plant at end of Operations and Maintenance Period	Sum	1		
		CARRIED FORWARD TO SUMMARY PAGE				

TAFALOFEFE HOSPITAL : WASTE WATER AND WATER TREATMENT
SCHEDULE 5. SCMU05-24/25-0037

Section 1.:PRELIMINARY & GENERAL

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
1	Compliance with General Conditions of Contract, Insurances, Sureties, Travelling, Out of Town Allowances					
1.1	Fixed	sum	1			
1.2	Value Related	sum	1			
1.3	Time Related	month	18			
2	Establishment on site and provision of buildings and storage facilities including de-establishment of site, cleaning and tidying up in the course of the contract					
2.1	Fixed	sum	1			
2.2	Value Related	sum	1			
2.3	Time Related	month	18			
3	Full time contract management and supervision of the works including liason with other Contractors and submission of installation programme including weekly revisions there to from time to time or as may be required by the Engineer					
3.1	Fixed	sum	1			
3.2	Value Related	sum	1			
3.3	Time Related	month	18			
4	Provision of Shop Drawings and Builder's Work Drawings for approval	sum	1			
5	Liaison with Local Authority, compliance with O.H.S. Act, Local By-Laws and any other statutory regulations	sum	1			
6	Liaison with DPWI compliance with DPWI corporate and safety regulations and any other DPWI requirements	sum	1			
7	Any additional item not specifically mentioned or included in the Bill of Quantities and for which the Tenderer may wish to detail	sum	1			
8	Security - Identification The tenderer must price for his staff to wear distinctive overalls / work clothes, bibs and hard hats for the duration of the contract name tags must be provided to all the employees on site whether in work clothes or not	sum	1			
					TOTAL CARRIED FORWARD	R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
					TOTAL BROUGHT FORWARD	R -
9	Provide a Health and Safety Plan in accordance with the OHS Act Construction Regulations, attend H&S meetings called by the Main Contractor, report on compliance with H&S Plan, appoint H&S reppresentative and manage H&S Plan for the duration of the					
9.1	Fixed	sum	1			
9.2	Value Related	sum	1			
9.3	Time Related	month	18			
10	Provide for additional H&S requirements,					
10.1	Fixed	sum	1			
10.2	Value Related	sum	1			
10.3	Time Related	month	18			
11	Provide a CEM Plan, attend meetings called by the Main Contractor, report on compliance with CEM Plan, appoint CEM reppresentative and manage CEM Plan for the duration of the contract					
11.1	Fixed	sum	1			
11.2	Value Related	sum	1			
11.3	Time Related	month	18			
12	Provision for additional testing to be spent as directed by the Consulting Engineer	sum	1			R 15 000.00
					TOTAL BILL NO. 1 CARRIED TO SUMMARY	

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	PREAMBLES For Preambles refer to "Department of Public Works: Specification of Materials and Methods to be used - PW371" which shall be read in conjunction with and shall apply to all items in these Bills of Quantities. **SUPPLEMENTARY PREAMBLES** Tenderers are referred to the specification and drawings prepared by Carifro Consulting Engineers, annexed to these bills of quantities for the mechanical work, for the full descriptions of the following items which are to be read and priced in conjunction with the said specification. Tenderer's attention is specifically drawn to the guarantee against defects, servicing and maintenance period and the testing and commissioning clauses, which is applicable to the whole of the fire protection installation. The contractor has to allow for these costs in his/her unit rates. The Contractor is to also take note of the following Terms of Reference and these should be strictly adhered to: Voice Alarm/Evacuation system All systems components and accessories shall be installed by personnel trained by the manufacturer; proof of this shall be submitted with the tender offer. All systems shall be installed according to the guidelines as stated in the manufacturer's installation, operation, inspection and maintenance manuals The system shall comply with SANS 7240-16/19 **Rates and descriptions** Unless separate rates for the supply and for the installation of any item is specifically called for, the supply and installation costs of any item shall be fully included in the unit rate and/or amount. The description of each item shall be deemed to include making, conveying and delivering, unloading, storing, unpacking, hoisting, setting, fitting and fixing in position, cutting and waste, patterns, models and templates, plant, temporary works, return of packings, establishment charges, profit and all other obligations arising out of the conditions of contract. **FIRE CONTROL PANELS** The supply and installation of flush wall mounted c/w all accessories needed for the proper operation of the system as described in this document. Price to include for built in power unit, recessed back box assembly and all mounting and fixing materials.					
1	4 Loop Fire Control Panel	each	1			
2	2 Loop Fire Control Panel	each	2			
				TOTAL CARRIED FORWARD		R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	TOTAL BROUGHT FORWARD					R -
3	Low profile remote display panel	each	12			
	SENSORS AND LINE DEVICES The supply and installation of sensors and line devices as specified. Price to include all installation materials needed.					
4	**Addressable Multisensor** Addressable Multisensor algorithm based technology low profile, base measured elsewhere	each	390			
5	**Surface Mounted Beacon** Addressable beacon with a clear lens and red LED element, controlled and powered via the Fire Loop	each	110			
6	**Base Sounder Beacon** Addressable electronic sounder beacon, controlled and powered via the Fire Loop. For use with sensors in items	each	15			
7	**Surface Mounted Base** For use with devices in items 3 and 4	each	485			
8	**Addressable Call Point** Surface or Recessed mounting, C/W resettable element and transparent flip-up cover, back box measured	each	75			
9	**Surface Mounted Back Box** Back box for use with call points item 7	each	74			
10	**Recessed Mounted Back Box** Back box for use with call points item 7	each	1			
10	**Line Sounder** Addressable electronic sounder, controlled and powered via the Fire Loop. Price will include for all sounder types i.e. Room, horn type sounder beacon and weather proof sounder	each	20			
11	**Line Isolators Module** Addressable short circuit isolator module suitable for DIN rail mounting. Housing measured elsewhere.	each	31			
12	Addressable In module providing for a connecting N/C contacts into the fire alarm system c/w end of line resistor. And suitable for DIN rail mounting. Housing measured elsewhere.	each	10			
13	**Addressable Relay Module** Addressable Relay module providing a voltage free N/O & N/C set of contacts (rated 1amp 30Vdc). Suitable for DIN rail mounting. Housing measured elsewhere.	each	10			
	TOTAL CARRIED FORWARD					R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	TOTAL BROUGHT FORWARD					R -
14	**Addressable Relay Module** Addressable Relay module providing two voltage free change-over contacts (rated 5amp 250Vac). Suitable for DIN rail mounting. Housing measured elsewhere.	each	10			
15	**Housing for modules** Box and cover for DIN rail mounted modules suitable for surface mounting or to be recessed into wall c/w DIN rail and all fixing materials needed.	each	10			
	SENSORS AND LINE DEVICES					
16	**Line Sounder Drivers** Addressable unit monitored and activating two output circuits for driving sounders C/W mounting box and all fixing materials needed.	each	8			
	AUXILIARY DEVICES					
17	**Evacuation Siren** 120db 24 V DC evacuation siren with red flash Beacon C/W mounting brackets and all fixing materials needed.	each	10			
18	**Power Supply** Supply and install 220Vac/24Vdc converter with 5amp dc output rating. Power supply, battery charger and battery/s, shall all be housed in wall mounted lockable metal housing c/w mounting brackets and all fixing materials needed.	each	8			
	VOICE ALARM SYSTEM					
19	A multifunctional 360W amplifier with built in hand held microphone, audio inputs, including the background music input, and the speaker output section which has an internal attenuator and 6-output selector (6 zones).	No	1			
20	360W Extension Amplifier for additional speaker output	No	1			
21	420W Power amplifier with overheating protection,	No	1			
22	Power amplifier input module	No	1			
23	Emergency power supply including batteries, capable of	No	1			
	TOTAL CARRIED FORWARD					R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	TOTAL BROUGHT FORWARD					R -
24	27U Rack with accessories for mounting the components above	No	1			
25	5 Inch 6W (100V) cone-type EVAC ceiling mounted loudspeaker	No	100			
26	Metal fire dome with ceramic bridging connector secured by safety chain including mounting supports	No	100			
27	Remote fireman's microphone	No	1			
28	Remote Desk Top system microphone with extension to access all zones	No	2			
	CONDUITS AND WIRE-WAYS The supply and installation of galvanised medium duty wiring basket c/w fixing brackets.					
29	**Straight Lengths** 50mm wide Wiring Basket	metre	2110			
30	**Cut Fittings (labour cost only)** Cut side of cable basket for take off or for making bend connections.	each	20			
	Supply and install conduit as specified placed in position for Chased in to brick work, surface mounting , and in ceiling void including bending, jointing, cutting, draw boxes, inspection bends, bends and saddles.					
31	25mm Conduit for sensors and line devices	metres	1390			
32	Extra-over for chasing	metres	150			
33	25mm Thin walled galvanised conduit Powder coated - high way yellow, for sensors and line devices	metres	340			
34	20mm flexible PVC coated conduit, in 1(one)	each	225			
	Supply and install Light weight galvanised conduit boxes Powder coated -high way yellow, placed in position for surface mounting on concrete or brickwork, and in ceiling void including covers, bushes and all fixing materials.					
35	Light weight galvanised steel shallow round boxes, side and /or back entry for 25mm conduit average for 1, 2, 3 &	each	1360			
36	100 x 100 x 50 galvanised steel boxes for 25mm or 32mm conduit including blank cover plates	each	26			
	TOTAL CARRIED FORWARD					R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	TOTAL BROUGHT FORWARD					R -
	CONDUCTORS Supply and install screened conductor as specified, for connecting fire panel. line devices and sensors					
37	1mm² x 2 core screened twisted pair PH120 cable (loop cable)	metres	6970			
38	1,5mm² x 2 core screened twisted pair PH120 cable (Speaker cable)	metres	5600			
39	0,75mm² x 2 core Mylar screened twisted pair cable	metres	1400			
40	0.5mm² x 8 Core cat 5 shielded twisted pair with RJ45 termination	metres	150			
	Supply and install 600/1000V grade PVC insulated copper conductors drawn into conduit /ducting					
41	2,5mm² Fire Resistant single core copper conductors	metres	45			
	Supply and install Fibre Optic Cabels drawn into conduit /ducting					
42	4 core 50/125 Multimode HDD Fibre Optic cable .	metres	180			
43	Terminations for above	No	4			
	MISCELLANEOUS ITEMS					
44	**DIN rail Mounted Splicing box** Din Rail box 4 x LC Duplex Multi Mode - Heat shrink type	each	4			
45	**RS485 to fibre optic converter** RS485 to fibre optic converter, model no. Westermo ODW-730F2	each	3			
46	**Housing for Network adapters** Box with clear cover for housing DIN rail mounted network adapters. Suitable for surface mounting on wall c/w DIN rail and all fixing materials needed.	each	3			
47	**SMS Modem Alarm Notification** Allow for the connection of SMS modem to the fire Control panel the Fire Detection and Alarm system for alarm notification to the Fire Brigade/all designated parties /personnel as specified by the Employer. The SIM card and cell phone numbers, will be provided by the Employer	sum	1			
	COMMISSIONING					
48	Testing, commissioning and signing off of entire system in accordance with SANS 10139.	sum	1			
	TOTAL CARRIED FORWARD					R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	TOTAL BROUGHT FORWARD					R -
49	Testing, commissioning and signing off of each Fire Panel for beneficial occupation	sum	4			
50	Testing and commissioning of integration between all access control, fire detection and alarm systems and certification of installation to SANS 14520	sum	1			
51	Comprehensive maintenance during the 12-month or extended guarantee period as per detailed specification	sum	1			
52	**TRAINING** Training of User's staff as specified	hours	4			
53	**BLOCK DIAGRAM ME** Provide coloured block/reference plans to indicate device positions, numbering of devices and display the devices assigned within zones. c/w mounting frame.	each	4			
54	DRAWINGS Provide "As Built" drawings electronic format (dwg) for	sum	1			
	OPERATING AND MAINTENANCE MANUALS					
55	Operating and Maintenance Manuals for approval	sum	1			
	Final Format Hard Copy only					
56	Operating and Maintenance Manuals	set	3			
57	Prints of "As Builts"	set	3			
	Final Format Electronic media format only					
58	Operating and Maintenance Manuals	set	3			
59	"As Builts" drawings	set	3			
	TOTAL CARRIED FORWARD					R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	General Items					
1	Provision of installation/ workshop drawings and builder's work drawings for approval of engineer	sum	1			
2	Submit detailed equipment schedules for approval	sum	1			
3	Provide "As Built drawings" (sets)	set	3			
4	Maintenance and Operating Manuals					
4.1	Hard copy format only	set	3			
4.2	Electronic media format only	set	3			
	Comprehensive maintenance during the 12-month or extended guarantee period as per detailed specification.	sum	1			
	Supply andinstall SANS 62-1/2 class medium steel piping. Pipes shall be free of rust, flakes or other defects and shall be cleaned internally before installation. The pipework shall c/w victaulic connections, hangers, supports, fittings and all necessary accessories. Black or					
	PIPEWORK AND FITTINGS Straight pipe lengths					
5	25NB- SCREWED	m	438			
	UNIONS-SANS 62 GALVANISED					
6	25NB- SCREWED	m	73			
	BARREL NIPPLES-SANS 62 GALVANISED					
7	25NB- SCREWED	m	69			
	ELBOWS-SANS 62 GALVANISED					
8	25NB- SCREWED	each	45			
	EQUAL TEE-SANS 62 GALVANISED					
9	25NB- SCREWED	each	3			
	LABOUR ONLY ITEMS - DRAWN CONNECTIONS Drilling / cutting and welding branch pipe connection					
10	25NB	each	9			
	HOT DIP GALVANISED PIPING					
11	'Extra over pipe and weld fittings rate for straight pipe and pipe fittings welded as an assembly and hot dip galvanised after welding	Kg	1095			
12	wrap measured on the basis of pipe outer diametre multiplied by 1,5 (double wrap measured as twice single wrap)	m	219			
			TOTAL CARRIED FORWARD			R -

Item No	Description	Unit	Qty	Supply Rate	Install Rate	Total Amount
	TOTAL BROUGHT FORWARD					R -
	PIPE SUPPORTS					
13	Hilti type rubber lined split clamps for wall fixing 15 to 50 NB piping	No.	80			
	VALVES & ACCESSORIES **Ball Valves - Full Bore**					
14	PTFE seats, stainless steel balls and corosion resistant valve handles 25 NB	No.	9			
	Fire Fighting Equipment					
15	Supply, delivery to site and installation of first aid wall mounted rotary fire hose reel (non-swinging type) with 30m length of 20mm bore polyvinyl chloride reinforced pressure hose c/w aluminum nozzle, ball valve and pressure gauge. One hose reel with an all weather enclosure	each	9			
16	Supply and install 9 kg DCP fire exstinguishers on an all weather enclosure	each	6			
17	Supply and install 5 kg CO2 fire exstinguishers including backing boards,	each	3			
18	Supply and install 4,5 kg DCP fire exstinguishers mounted on woodern backing boards	each	25			
19	Supply and install fire blanket for the kitchen block	each	1			
	Signage Photoluminesxent Signage in line with SANS1186.Signage detail and fixing detyailto be allowed for. Sign Fixing Detail to be presesnted to the presente to the Engineer fo apprroval before procurement and					
20	Hose reel signage with direction arrow	each	9			
21	Fire blanket signage with direction arrow	each	1			
22	extinguisher with direction arrow	each	35			
	<u>Testing and commissioning</u> Allow for testing the water pipe reticulation installation (pipe supplies to isolating valves) in accordance with the					
23	National Building Regulations	sum	1			
24	Testing, commissioning and signing off of the systems installation in accordance with SANS standards					
25	Training of User's Staff in the operation of the fire fighting systems installed	hours	2			
	TOTAL CARRIED TO SUMMARY					R -

ANNEXURE B

TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS

CONTRACT SCMU5-24/25-0037

PROJECT SPECIFICATION (SCOPE OF WORKS)

INTRODUCTION

This project specifications form an integral part of the Contract and are supplementary to the Standard Specifications.

The Project Specifications comprises of the following:

1. Standard Specifications as contained in the SABS 1200 series specifications.
2. Portion 1 describing the Works.
3. Portion 2: Variations and additions to the Standard Specifications (SABS 1200) .
4. Particular Specifications (Pertaining to Portions 1 and 2)
5. Portion 3: Electrical Installations, Fire Detection and Fire Extinguishing
6. Any specification referred to in the above.
7. The drawings as listed.
8. Schedules of Quantities (Schedule 1 to 5)
9. Health and Safety Specifications.
10. Environmental Management Specification

STATUS

If any discrepancies exist between the following, the order of precedence will be in the following sequence:

1. Project Specifications
2. Standard specifications
3. Drawings

- The descriptions in the Schedule of Quantities are abbreviated and the above specifications will take precedence. In the absence of a complete description in the Project Specification, the description in the SOQ will form part of the specification.

- If no specification exists anywhere other than the Schedule of Quantities, it will be deemed to

be the specification in addition to the standard industry specification, e.g., SANS 2001.

- Any omissions in the project specifications must not be construed as a relaxation of specifications, in which case SANS 2001 requirements will be the minimum specification.

PORTION 1

THE WORKS

PS1 GENERAL DESCRIPTION OF THE WORKS

This Contract comprises of the following:

A: CIVILS:

The following is an abbreviated scope of the civil works under this contract and is measured in Schedule 2 of the Schedule of Quantities (SOQ):

Sundries Civil Works:

- Civil works, e.g., trenching for pipework and cabling.
- Construction of earth wall in existing pond.
- Stormwater protection, lined channels, and walkways.
- Completion of existing pump house and other small buildings by finishing off, painting etc.
- Minor building works, e.g., chasing, concrete plinths for mechanical equipment.
- Replacement of the existing asbestos-cement water reticulations system.
- Installation of the fire reticulation system, including the connection to the new fire hose reels and site hydrant.
- Domestic and fire pump installation.
- SME Packages:
  Clearing of vegetation
  Maintenance of paver block roads.
  Small building works
  Repairs to plumbing and other internal building services.

Rehabilitation of Protection of Existing Dam

- The embankment and spillway of the existing earth fill dam is eroded and must be reinstated by protecting with new riprap, gabion baskets and “Renno” mattresses.

- The access of animals to the dam must be limited by erection of vermin proof fencing around the dam and the creation of access points for the watering of animals.

B: MECHANICAL

The following is an abbreviated scope of the mechanical works under this contract that pertains to water treatment processes and is measured in Schedule 3 of the Schedule of Quantities (SOQ):

Sewerage Treatment Works (STW)

The concrete reactor and underground pipework have been substantially completed under a previous contract, but the following components are required to complete the installation under this contract, including the commissioning of the plant:

The following is required to complete the 150m^3/day activated-sludge, extended aeration sewage treatment works:

- All pipework for low pressure air lines including bubble diffusers.
- Scum removal system in the settling tank
- Connection of low-pressure air lines to fluid conveyance pipes for the air lift circulation and discharge pipes.
- Blowers with motors, and electrical control panel.
- Chlorination equipment.
- Start-up, testing and commissioning of sewage treatment works.
- Training of the staff of the Department of Health.
- Sampling and testing of influent, reporting and record keeping.
- Operation and Maintenance of the Wastewater Treatment Plant, the Water Purification Plant and the recently completed raw water pump station at the nearby dam for a period of 24 month after Practical Completion.

The specifications for the above is contained in the Particular Specifications BSA.

Water Purification Plant (WPP)

A new water purification plant with a capacity of 15m^3/h must be installed and commissioned, while the existing plant is kept operational.

The existing water storage facilities must also be augmented by the installation of prefabricated steel reservoir on ground level with a capacity of 250m^3.

The pipework in and around the new treatment works must be modified to suit the new system and jockey pumps must be installed to connect the existing storage facilities into the raw water system.

A new plant room must be constructed to accommodate some of the components of the new purification plant and the smaller jockey pumps and fire pumps.

A new plant room must be constructed to accommodate some of the components of the new purification plant and the smaller jockey pumps and fire pumps. The specifications for this are to be found in the Particular Specifications BSW.

C: ELECTRICAL

The following is an abbreviated scope of the electrical works and fire detection and fire extinguishing work under this contract is measured in Schedule 4 and 5 of the Schedules of Quantities (SOQ) and

is more comprehensively covered in Portion 3.1 to Portion 3.4:

The following are the electrical part of the Works:

1. Electrical Surveillance
2. Electrical Installations
3. Fire Detection and Extinguishing.
4. Indoor Generator

PS2 LOCALITY AND ACCESS

The site is located at Tafalofefe Hospital, near Kentani, some 20km inland from Mazeppa Bay. It can be reached from the N2 national route between Butterworth and Duytwa, taking the turnoff to Mazeppa Bay and travelling on the gravel road for ± 45km to Tafalofefe Hospital.

The site co-ordinates are: South 32°25'45", East 028°28'28".

The condition of the gravel road is variable, but generally accessible with a two-wheel drive light delivery vehicle.

Site elevation: 380m AMSL

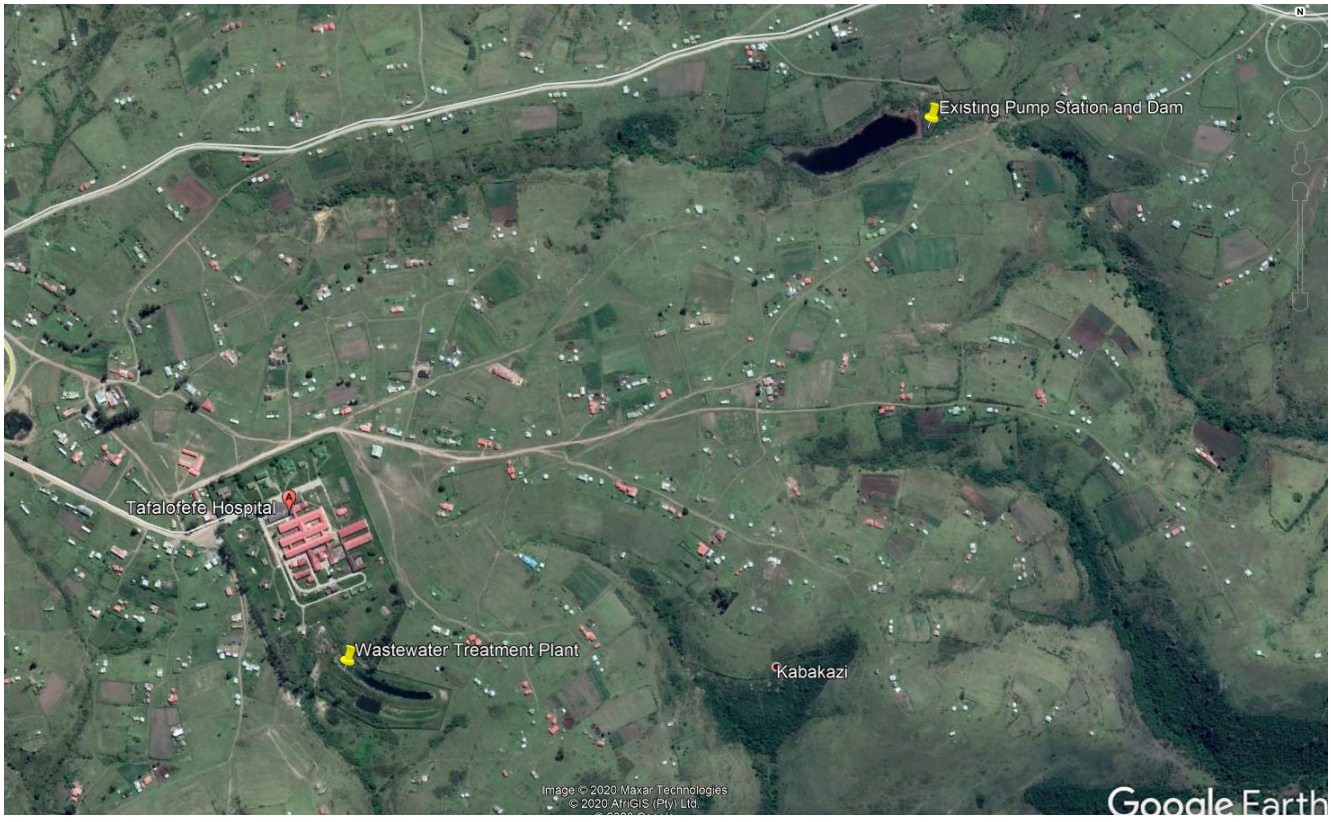


Figure 1: Site Map

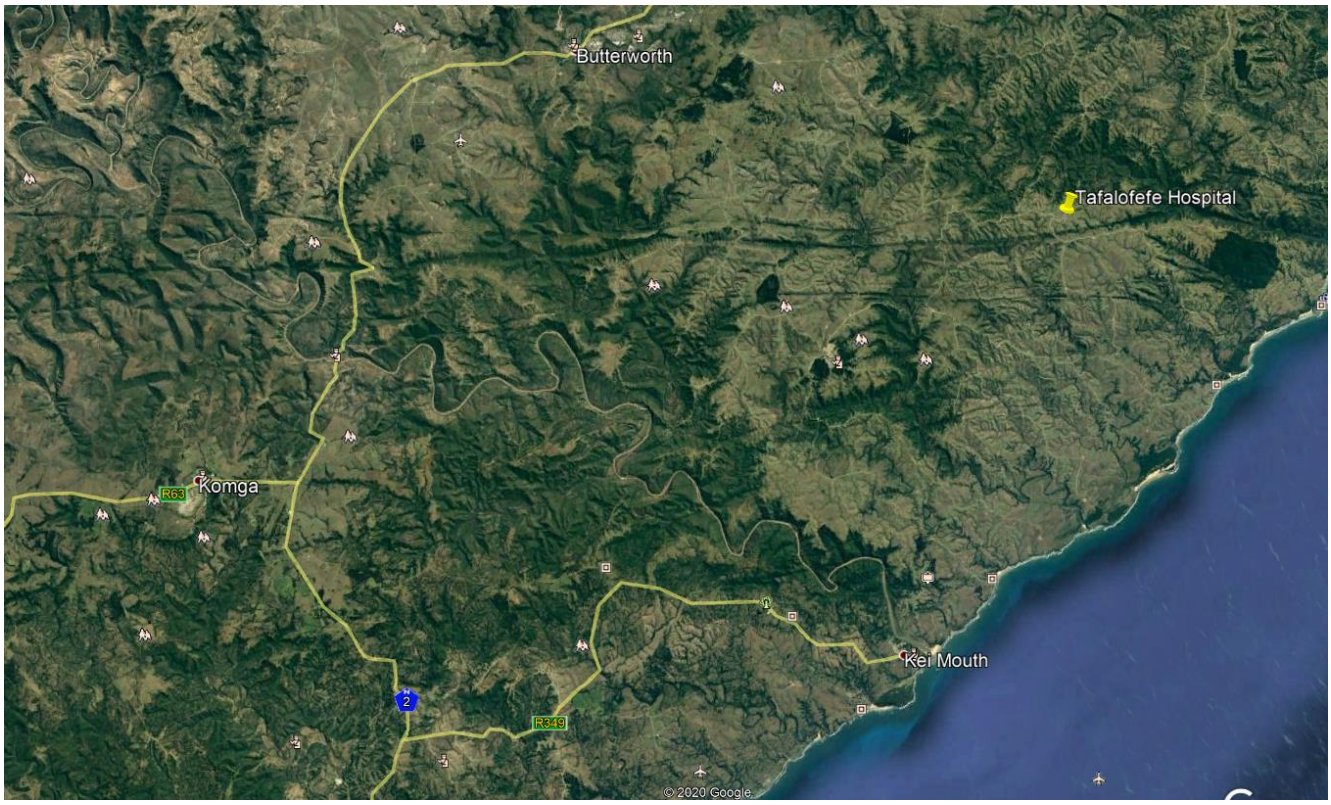


Figure 2: Regional Location

PS3 SITE CONDITIONS

The site is on the premises of an existing rural fully functioning hospital.

The terrain is underlain by sandstones and mudstones of the Beaufort Group, Karoo sequence with dolerite intrusions in places.

Most excavations on site will be in silty and clayey soil that can be excavated by hand. Bedrock depth varies across the site and is at surface level in places.

The area is in the summer rainfall region, with an average annual rainfall of approximately 950mm, with maximum summer temperatures in the mid 30°C range and minimum winter temperatures in the mid 10°C range.

More complete rainfall figures are tabulated in the Contract Data.

The nearby dam from which the water to the hospital is pumped can only be reached across jeep-track which become difficult to traverse under wet conditions. The topography around the dam area is relatively steep and is difficult to reach in places.



Figure 3: General area where new Water purification plant will be located. (Existing treatment works in the background)



Figure 4: Site of the wastewater treatment plant. (Round reactor in the middleground) (Existing treatment works in the background)

PS4 DETAILS OF CONTRACT (SCOPE OF WORKS)

The successful tenderer will be required to supply all material, labour, transport etc. to complete the works. The work will entail the following:

1. Notifications and applications to Department of Labour
2. Establish necessary personnel and equipment on site.
3. Administration of Contract.
4. Attendance of bimonthly progress and technical meetings by the designated contracts director (compulsory).
5. Oversight and co-ordination of Nominated Subcontractors.
6. Compliance with applicable Health and Safety Legislation, Regulations and Specifications.
7. Employ local labour from the community.
8. Appointment and oversight of SME's.
9. Procure and deliver materials and equipment to site.
10. Complete all works described in the project specifications.
11. Oversee the commissioning, operation and maintenance of the plants and equipment for 24 months under the Nominated Subcontract and this Contract.
12. Removing of site establishment and cleaning up of construction areas.
13. Comply with 12month defects liability period requirements.

PS 5 CONSTRUCTION PROGRAM

The contractor must submit a detailed construction program in a Microsoft Projects format showing the critical path of activities.

The following are basic requirements:

It must be co-ordinated with to disrupt services to the hospital to an absolute minimum.
A lead time of at least 2 months for the submission and approvals of designs.

The existing water purification plant can only be de-commissioned when the new treatment plant has been successfully commissioned.

PS6 SITE FACILITIES AVAILABLE

PS6.1 Water

Raw water is supplied to the site via a newly refurbished pumping station at the nearby dam at a rate of ± 6lit/sec.

In general, the contractor must make his own arrangements with regards to the supply of water for construction purposes on all parts of the site and must bear all costs in this regard.

PS6.2 Electrical power

Electricity is available on site, but the contractor must make his own arrangement with Eskom for a temporary connection and bear all costs in this regard, including consumption.

PS6.3 Telephones

Only Cellular telecommunication signals is available. The contractor must make his own arrangements for telecommunications.

It is a requirement of this contract that the Contractor must be able to receive and send information

via e-mail from his site establishment and be able to print at least A4 documents in colour.

PS6.4 Toilet facilities

The contractor shall supply all temporary sanitation facilities required for his personnel and visitors. These must always be kept clean and hygienic and comply with Health and Safety and Environmental Legislation.

PS7 SITE FACILITIES REQUIRED

PS7.1 Contractor's site establishment

The Contractor must establish on site in positions approved by the Employer in co-operation with the Hospital Management.

The contractor must establish functional and neat facilities for himself as is necessary to execute and administer the Contract efficiently. It must also include a board room with enough seating for 12 persons, which will serve the purposes of his own internal meetings and site meetings for the purposes of the Employer and his professional team.

The following form part of the establishment as a minimum:

- A drawing rack with aluminium clamps for A0 contract drawings.
- Board room table with 12 chairs.
- Desk for the purposes of the Engineer.
- Secure lockable storage space for samples of approved materials, like kerbs, paver blocks, fence components etc.
- Calibrated automatic level with staff.
- 100m tape measure
- Lockable filing cabinet for recordkeeping.
- Rain gauge.
- Triplicate site diary
- Triplicate site instruction book

PS7.2 Facilities required by the Engineer

A 3.6x4.8m project nameboard is required to be erected near the site. The Engineer will provide the design of the graphics on the board in JPEG format.

No site facilities are to be provided for exclusive use of the Engineer/ Principal Agent. However, some facilities will be shared as indicated in PS7.1

The contactor must have available on site a complete set of the latest drawings and specifications in a tidy condition for reference purposes by the Engineer and others.

PS8 FEATURES REQUIRING SPECIAL ATTENTION

PS8.1 Existing services.

Existing services are shown on drawings or will be pointed out to the contractor before work

commences. The contractor must then locate, mark, and protect the existing services in order to avoid damage to the services during construction.

The contractor must take all precautions against damaging existing services and will be held responsible for the consequences of breakages or disruptions.

PS8.2 Stormwater and ingress of water

The contractor is deemed to have made provision for the control of stormwater and the ingress of water into underground in his rates and prices. He must construct temporary control measures like berms, temporary drainpipes etc. to control the inflow of water into excavations and construction areas.

Ingress of water into the subgrade must be controlled and minimized as far as possible as this will negatively impact on progress when the subgrade is inundated.

It is highlighted that the area where the new Water Purifications Plant, Plant Room, New Fire Storage Tank and connecting pipework is to be constructed is saturated due to the uncontrolled discharge from the existing settling tank. Therefore, the new 160Φ sludge discharge pipe to the sewage treatment ponds must be installed as a matter of priority.

PS8.3 Setting out of the works

The Contractor must employ a qualified Land Surveyor to set out the important features of the works from the given survey benchmarks.

The Engineer will provide the co-ordinates of some key points for setting out of the works from where the Contractor must set out the detail of the works.

The contractor must at all times have on site a calibrated automatic level on site with tripod and 5m staff.

PS8.4 Health and Safety

The contractor and his subcontractors must always be compliant with the Occupational and Health Safety Act, 1993: Construction Regulations, 2014, and subsequent amendments, hereafter called the Health and Safety Regulations.

The complete Health and Safety Specification is annexed to this document.

The employer has commissioned an independent Professional Health and Safety Service Provider that will carry out inspections and audits in terms of the Regulations.

Application for any Exemptions in terms of the Health and Safety Regulations is the responsibility of the contractor. The exemption will not be deemed to be in place unless the contractor can provide written proof of such exemptions granted.

Obligations stipulated in the Regulations form part of this contract and the relevant tendered prices in the Schedule of Quantities is full compensation to comply with the Health and Safety Regulations.

PS8.6 Environmental Protection

The contractor must comply to Environmental Legislation. An Environmental Management

Specification is annexed to the Project Specifications and forms part of it.

The employer has commissioned an independent Professional Environmental Practitioner who will monitor the and report on compliance during construction.

PS8.7 SME's

It is part of the scope of this Contract that the Employer will call for tenders and appointment of Small and Medium-sized Enterprises (SME's) to carry out the work for which provisional sums have been allowed in the Schedule of Quantities.

These SME's will be Domestic subcontractors to the Contractor and the cover of his Insurance Policies must include to cover these enterprises.

The Contractor must deduct 10% retention monies from the payments to the SME's until practical completion of their work has been to the specifications and approval of the Engineer, whichever is last. "

The SME's will rbe given the opportunity to price Preliminary and General and cost associated with their contribution to OHS Regulations, e.g. PPE. However, the contractor will be responsible for the training and monitoring.

The prices and rates of the Contractor is deemed include for all risks, profit, training, oversight, co-ordination and management of the SME's.

PS.9 APPLICABLE STANDARDIZED SPECIFICATIONS

For the purpose of this contract the following standardized specification of SABS 1200 will apply:

Section	Description	Edition
General	SABS 1200 A	1986
Site Clearance	SABS 1200 C	1980
Earthworks	SABS 1200 D	1988
Earthworks (Pipe Trenches)	SABS 1200 DB	1989
Gabions and Pitching	SABS 1200 DK	1996
Earthworks (Roads, Subgrade)	SABS 1200 DM	1981
Concrete (Structural)	SABS 1200 G	1982
Structural Steel	SABS 1200 H	1990
Medium Pressure Pipelines	SABS 1200 L	1983
Bedding (Pipes)	SABS 1200 LB	1983
Sewers	SABS 1200 LD	1982
Stormwater Drainage	SABS 1200 LE	1982
Segmented Paving	SABS 1200 MJ	1984
Kerbing and Channelling	SABS 1200 MK	1983

The latest revision of Specification of Materials and Methods to be used published by Department of Public Works (PWD371) will be applicable on building work where applicable.

SANS2001 series specifications will apply where not covered by SABS1200.

PORTION 2

VARIATIONS AND ADDITIONS TO STANDARDIZED AND NON-STANDARDIZED SPECIFICATIONS

PSA GENERAL (SABS 1200 A)

PSA.1 Quality (Clause 3.1)

All materials to be used for the completion of the works must comply with the applicable standards and requirements of the South African Bureau of Standards or SANS and bear the SABS/SANS quality mark. If it does not bear such a mark, the Contractor must notify the Engineer before placing an order. The Engineer may waiver the above requirement if evidence is provided that the product matches or exceeds the requirements of SANS by comparing the marks that the product does comply with, e.g., BS, EU or American standards.

PSA.2 Testing and Quality Management (Clause 7)

All quality control tests, e.g., concrete strength and soil density tests, will be executed at the cost of the contractor.

Costs of the tests required are deemed to be included in the rates of the items that are subject to testing:

The contractor must submit a Quality Management System for approval prior to commencement of the Works.

The quality management system must be structured in such a manner that it ensures that the Contractor does not proceed with work without ensuring quality and compliance checking as work progresses. The system must address the following:

- Confirmation of material specifications, drawing references, dimensions, setting out and levels.
- Signing of subgrade preparations
- Signing-off of items by responsible persons prior to proceeding, e.g., shuttering, reinforcing, pressure testing etc.
- Record keeping (photographic, documents etc.)
- Recording of deliveries, batches, testing cross refences.
- Proper recording, cross referencing of testing, results, sample numbers etc.
- Confirmation of calling for inspections by the Engineer or other professional.

In the event of the contractor making use of ready-mix concrete supplied by others, independent sampling of concrete must be done. The results of supplier will not be accepted in the absence of at least 20% cross referenced test taken by the Contractor on site. These cubes must be taken just before discharging from the ready-mix truck to ensure independent testing. The cubes must be delivered to an independent SANAS accredited laboratory.

The Engineer may request calibration certificates of any testing equipment used at any time.

A slump test of every single ready-mix delivery to be taken before discharging.

The contractor is required to monitor the slump of any concrete mix prepared on site or delivered from a ready-mix concrete plant.

Please note that the hairline cracking and delamination of plasterwork will not be acceptable because this has an influence on future maintenance cost of paint finishes.

Test results must be supplied to the engineer immediately after they have become available.

The contractor must implement a full quality assurance plan that should cover the following:

- Setting out and levels and positions of earthworks and services.
- Quality of sand and stone for concrete.
- Method and control over accurate batching of concrete.
- Fixing of reinforcing and control over cover.
- Curing of concrete.
- Concrete cube test.
- Quality and accuracy of shuttering within the specified tolerances.
- Materials testing for earthworks
- Testing of coating thicknesses
- Survey of final floor levels for compliance with TR34
- Pressure testing of pipelines

The above is not meant to be complete but indicative.

The contractor is required to keep full records of the results of his quality assurance programme on site, including dates, positions, all properly cross referenced.

PSA.3 Time Related Preliminary and General Items and Progress

In the event of the Contractor falling more than 15% behind program (measured as a percentage of the Time for Completion elapsed) due to poor performance or lack of due diligence to execute the contract, and no reasons or circumstance that could reasonably justify an extension of time in terms of the Contract, the Engineer may at his sole discretion certify for payment the Time Related Items to amounts that are commensurate with the progress of overall work done and not according to the percentage time of the contract that has elapsed.

PSA.4 Dayworks

Provisional amounts have been allowed for materials, equipment, and labour. Dayworks will only be used upon specific written instruction by the Engineer that certain work must be done on a daywork basis.

In addition to the abovementioned amounts, provision is made for a mark-up to be used during the execution of dayworks. Payment shall be regarded as full compensation for overheads, charges and profit and transport of the materials to be used when executing dayworks.

Where dayworks have been instructed by the engineer the returns must be submitted by e-mail or in person for signature of approval within 24 hours of the end of the working day on which the work was executed. Daywork returns shall be submitted on approved forms.

It must be noted that all head office, managerial and supervisory staff down to foreman level are excluded from dayworks because these are deemed to be included in the prices of Preliminary and General.

Rates for different Categories of Labour will take precedence over Labour paid on a Mark-up basis.

PSA.5 Contractor's facilities for carrying out the works

The contractor must establish offices and stores that he deems necessary. The contractor shall supply, erect, and maintain all offices and shelters for the use of himself and his workforce.

The contractor must make his own arrangements for the housing of his workforce off site.

The entire area occupied by the contractor's operations shall, on completion of the contract, be reinstated to the condition that existed before construction commenced, with all debris and building rubble and surplus material removed.

PSC SITE CLEARANCE: SABS 1200 C

PSC.1 Clearing of Fence Line

In addition to stipulations of 8.2.1, the rate for clearing of strips of fence lines must also include for the levelling and trimming of ground level eliminate openings or gaps under the fence mesh. It must also include for any additional widths the contractor may require to erect the fence.

The rate also includes for the breaking down and mulching of plant material to reduce volume to be efficiently loaded and transported.

Transport to unspecified dumping site will be paid under limited overhaul or long overhaul as scheduled under SABS 1200 D: Earthworks

The minimum width allowed and stated is deemed to be sufficient for executing the work effectively, material handling etc. Any additional clearing will be for the cost of the Contractor, without compensation.

The Items are measured in linear metres along the fence line and includes for gates.

PSC.2 Grubbing and Clearing

This item is only applicable to areas, pipeline routes and fence routes that have not been cleared otherwise or do not require clearing due to the absence of significant vegetation.

Omit from Clause 3.1 the following paragraph starting and ending as follows:

> "All tree trunks…..…..of the Employer"
> and replace with:
> "The Contractor may dispose of timber at his discretion and as the Employer lays no claim to ownership of sawn timber on site."

Insert the following after "…..approximately 130kW" in Claus 5.3(c) :

> "…., or a hydraulic excavator with 150kW rated power and a bucket force of 150kN (Hitachi ZAXIS 200 or equivalent)…".

All tendered rates pertaining to grubbing and clearing includes for temporary stockpiling, processing, and loading and transport within the free-haul distance applicable to the contract as

specified in SABS 1200 D.

PSC.3 Clearing of General Vegetation

This item pertains to areas around the site that are overgrown with tall weeds, shrubs, and small trees. The vegetation in these areas must be removed to promote the regrowth of grass for effective ground coverage.

The contractor must cut all vegetation to a height of less than 50mm and grub the root of small shrubs and trees. Vegetation must be mulched and stockpiled to allow for drying out and wilting for at least 2 weeks before loading and transporting for disposal in manners and sites where instructed. The rates must include for loading and offloading at the designated dumping sites or compost heaps.

Transport to unspecified dumping site will be paid under limited overhaul or long overhaul as scheduled under SABS 1200 D: Earthworks.

Measurement and Payments
The unit of measure is ha (hectares) measured on plan.

PSC.4 Control of Regrowth

This item pertains to the areas cleared under PSC.3 and which must be maintained during the Construction Period and the O&M period.

The contractor must trim the grass at regular intervals to promote the spreading of grass and to discourage the regrowth of shrubs and weeds and remove these if any regrowth appears**.** The contractor must cut grass to when it reaches a nominal average height of 75mm or at least every 3 months, whichever occurs most often. During the mowing, the Contractor must remove any foreign weeds or vegetation other than grass that will create an effective ground cover in the long term.

Just before practical completion, the contractor must revisit these areas, cut the grass down to a length of 50mm and remove all regrown shrubs and weeds that is not described as grass.

Measurement and Payments
The item will be paid per hectares cleared under PSC.3 and pro-rata of the tendered rate relative to the construction period expired, irrespective of the number of times the areas have been retrimmed. The item will only be paid when the Contractor keeps the growth in check and below 100mm nominal average height of regrowth.

The rate covers everything necessary to control the growth of vegetation in these areas, including the harrowing, loading, and offloading of grass cuttings and other vegetation at designated dumping sites and or compost heaps. It also includes for the transportation of vegetation within a free-haul distance of 0,5km to a designated compost heap or dumping site.

A distinction is made between the control of regrowth during the Construction Period and the O&M period by scheduling an Item for each. The tendered rates for each take into account the difference

in cost to perform the described work, the change of Preliminary and General arrangements and costs, staffing, site establishment and equipment. This is in conjunction with the relevant Preliminary General Items priced for each of the periods mentioned above. The rates also take into account the re-establishment of personnel and equipment during the O&M period if he elects to remove these from site or retain skeleton staff at varying levels.

The relevant Items are measured and payable as the product of hectares maintained and months during which the result of maintenance work complied to the stated specification, regardless of the number of times that the Contractor attended or mowed these areas. (Unit of measure: hectare.month = ha.month.)

PSC.5 Weeding of Paving

The contractor must remove all weeds and grass from the block paving roads by a method that is environmentally safe, and approved and acceptable. Only approved weed killers may be used. If manual labour or equipment is used, it must be done in a manner that does not damage the paving. The use of vinegar, salt or baking soda may also be used, especially for the long-term maintenance of the paving.

Measurement and Payments
The unit of measure is ha (hectares) measured on plan. The rate includes for the transport of vegetation to an approved composting heap located on site.

PSC.6 Control of Weeds in Paving

This item pertains to the paving cleaned under PSC.5 and that must be maintained during the Construction Period and the O&M period.

The contractor must routinely remove weeds to eliminate significant regrowth. Just before practical completion, the contractor must carry out a final cleaning up operation across all paving.

Measurement and Payments
The item will be paid per hectares cleared under PSC.5 and pro-rata of the tendered rate relative to the construction period expired, irrespective of the number of times the areas have been cleaned. The item will only be paid when the Contractor keeps the regrowth in check.

The rate cover everything necessary to control weeds, including removal to the composting heap on site.

A distinction is made between the control of regrowth during the Construction Period and the O&M period by scheduling an Item for each. The tendered rates for each take into account the difference in cost to perform the described work, the change of Preliminary and General arrangements and costs, staffing, site establishment and equipment. This is in conjunction with the relevant Preliminary General Items priced for each of the periods mentioned above. The rates also take into account the re-establishment of personnel and equipment during the OM&M period if he elects to remove these from site or retain skeleton staff at varying levels.

The relevant Items are measured and payable as the product of hectares maintained and months during which the result of maintenance work was efficient, regardless of the number of times that

the Contractor cleaned the paving. (Unit of measure: hectare.month = ha.month.)

PSC.7 Removal of Asbestos Components

The roofs and rainwater goods of the buildings to be demolished contain asbestos. These materials must be dealt with and disposed of in accordance with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) and the Asbestos Abatement Regulations of 10 November 2020.

The components are described in the Schedule of Quantities and identified on the following photographs.



Figure 5: Chlorine hut with asbestos roof to be demolished



Figure 6: Floc dosing building with flocculation channel and settling tank in foreground.

This item covers all the work, methods, specialist registered subcontractors and other requirements to dismantle, transport to a site Compliant with and dispose on a site arranged by the Contractor that complies with the latest Asbestos Regulations.

The tendered rate is measured per square metre in plan of asbestos coverer roof, regardless of

composition, pitch and internal make-up or ceiling type. It is fully inclusive of everything required for the safe removal from site and no additional compensation is applicable.

The tenderer rate also includes a Certificate of Compliance issued by the service provider certified to carry out the work.

PSC.8 Demolitions

General

Some of the buildings to be demolished form part of the existing Water Purification Plant and may only be demolished when the new Water Purification Plant has been successfully commissioned and has proven to be reliable. This will also affect some of the work subject to the Asbestos Abatement Regulations.

Scope

The buildings to be demolished on site are identified in the Schedule of Quantities with the approximate plan dimensions.

The rates are deemed to collectively include for everything required for the complete demolitions of the buildings or structures. Any materials that the contractor manages to salvage becomes his property and he may dispose of it as he deems fit.

The Contractor must strip out all materials and components that cannot be successfully or safely buried or used as filling. This would generally include roof sheeting, timber, and window frames etc.

The useable material, like broken down masonry, concrete and filling under surface beds must be separated from unsuitable material, loaded, transported, dumped, spread out and mixed with other fill material from site, or buried in accordance with the instructions of the Engineer.

The demolition methods are at the discretion of the Contractor but must comply with Health and Safety Regulations.

It must be noted that the roofs, rainwater goods and barge boards of some of the buildings contain asbestos and must be disposed of according to the Asbestos Abatement Regulations 2020.

The limitations placed on the plant in terms of weight, power, and force in Clause 5.3 c) and additions does not apply to this Clause to Demolitions and tendered rates cover any plant irrespective of the capacity of the equipment required.

Measurement and payment

The tendered rates are measured as a Sum per structure and are fully inclusive for the entire operation to deal with the demolition of the superstructure, incorporating into fills or disposal of unusable material, including all transport.

The breaking up of reinforced slabs and underground concrete foundations and floors are measured separately.

Any earthworks required for burying and the transport of materials that can be safely buried or incorporated into fills will be paid for under the relevant under Earthworks (SABS 1200D).



Figure 7: Settling tank to be demolished



Figure 8: Floculation channel to be demolished

PSC.9 Demolition of reinforced suspended slabs

The suspended slabs require additional measures to demolish, including temporary propping.

Measurement and payment
The unit of measure is cubic metre of reinforced concrete that must be broken up and include for loading and offloading and incorporating into fills.

Any earthworks required for burying and the transport of materials that can be safely buried or incorporated into fills will be paid for under the relevant items under Earthworks (SABS 1200D

PSC.10 Breaking up of Foundations and floors.

This item covers the breaking up of underground concrete foundations that must be broken up and include for loading, and offloading and incorporating into fills.

Measurement and payment
The unit of measure is cubic metre of underground concrete that is broken up and includes for loading, offloading and incorporating into fills.

Any earthworks required for burying and the transport of materials that can be safely buried or incorporated into fills will be paid for under the relevant items under Earthworks (SABS 1200D

PSD EARTHWORKS (SABS 1200 D)

PSD.1 Working Space

For the purposes of calculating excavation volumes, working space will be for allowed as follows:

- No allowance for working space is made for the construction of manholes and is deemed to be included with the relevant items for manholes and earthworks for trenches.

- Lateral allowance for working space for structures and bases deeper than 1.0m will be made to the extent of 0.6m outside the perimeter of the base. For structures deeper than 1.0m, lateral allowance will be increased to 0.75m.

- For structures deeper than 2,0m below ground level, an allowance of 1,0m outside the plan dimension of the base will be taken as the perimeter of the excavation. This is not applicable to manholes.

The above only applies where shuttering is required and not in instances where concrete is cast against soil surfaces like spot bases at depth.

The above working space allowances are deemed sufficient to carry out work like brick laying, plastering etc.

PSD.2 Spillway embankment

The embankment above the dam spillway is steep and is subject to erosion and rockfalls. The gradient of the embankment must be reduced to 1v:3h before any work commences (Ref Fig 9).

The excavations are measured as restricted in accordance with definition of SABS 1200D Clause 2.3.

The contractor may not carry out the work in a manner that causes the spill of material downwards onto the dam spillway and must select the equipment and working methods accordingly.

PSD.3 Excavations for Gabions

The existing spillway is eroded and must be reshaped by excavating by hand to bed gabions and “Renno” mattresses in areas and on gradients that are inaccessible for excavation equipment. The excess material must then be loaded and transported to approved dumping sites.

The relevant rate covers all cost and is full compensation for working in these areas where production rates will be low and loading.



Figure 9: Spillway embankment

PSD.4 Earthworks for channels, cut-off drains and reshaping of soil surfaces

Further to Clause 8.3.2, the rates also include for the neat trimming of surfaces and compaction of in-situ to 90%, and to a depth of 100mm, ready to receive linings, stone pitching, or concrete. Compaction of filling from the excavations is done to 95%.

PDSB EARTHWORKS (PIPE TRENCHES) (SABS 1200 DB)

PSDB.1 Restricted Access

Some services are installed in locations in the hospital building complex which are within courtyards where the access for machinery and equipment will be impossible, and the transport of materials will have to be by hand along routes that will require barricading to separate working areas from the public and hospital staff.

The relevant tendered rate is full compensation to deal with the work under these circumstances, including all earthworks, the handling and laying of pipes and fittings to be installed and reinstating bedding and fill blankets selected from excavations.

Measurement and Payment

The unit of measure will be per cubic metre of excavation as measured according to SABS 1200DB and is and Extra Over item to trench excavations.

PSDE SMALL EARTH DAMS (SABS 1200 DE)

PSDE.1 Scope

This section deals with the construction of a partition embankment in Pond No 1 under

submerged conditions. The embankment must have a crest width of 3,5m wide and embankment gradients of 1v:3h.

The embankment is approximately 25m long and the maximum water depth in the pond is approximately 1.5m.

The construction of the partition cannot commence until the Wastewater Treatment Plant is operational and inflow into Pond 1 (primary pond) has been diverted to the plant.



Figure 10: Primary Pond No 1 where the parition embankment is to be constructed

The Contractor must submit to the Engineer the methodology he proposes for laying dry the footprint under the new earth partition embankment in Pond No 1. The laying dry method and the results of is entirely at the cost and risk of the Contractor, including flooding, rainfall etc. The estimated volume of the pond at full capacity is a 5000m^3.

The following possibilities exist for laying dry:

- Partially empty the pond by pumping the water over into the empty Pond No 4.

- Construct temporary embankments on both sides and pumping out between the embankments. The embankments may be constructed of soil, sandbags, or other methods.

- Combination of the above.

The Contractor may propose other methods if he so wishes.

PSDE.2 Laying Dry

The tendered rates for the laying dry of for the construction of the embankment must include for all risks, costs, overheads, and profit etc., including pumping equipment, temporary embankments and shoring that may be necessary to lay dry the working area and to maintain or reinstate it. The unit of measure will be Sum.

PSDE.3 Material Selection

The contractor must select material from excavations on site that will be suitable for construction of the partition embankment consisting of impervious material. The material must comply with the following:

- G7 natural gravel or better
- Friction angle of 25º or greater
- Fraction passing through .075mm sieve to be 25% or greater.
- Cohesion 60kPa or better
- CBR> 15%
- Permeability not more than 10^{-8} m/sec

The tendered rates must include for soil laboratory testing with a SANAS accredited laboratory.

PSDE.4 Importation of Materials

The Engineer may instruct the Contractor to import suitable material from a commercial source in addition to materials selected from excavations on site.

The tendered rate is Extra over to Forming of embankments and includes for the cost of transport, including loading and offloading, royalties, cost of opening and closing of borrow pits etc.

The unit of measure is per cubic metre in measured in final compacted positions.

PSDE.5 Rip-Rap Toe at Existing Dam

Before the filling for the rip-rap against the existing dam embankment is commenced, a toe anchor of angular stone with nominal diameters between 150mm and 250mm must be placed on a double layer of geotextile filter bed below water level.

A backhoe loader or other suitable equipment must be used to carefully and in a planned manner lay down a rip-rap strip of which the highest point is at least 1m under the water surface, with a base width of 3,0m against the 1:3 embankment and a height of at least 1,25m. This must be done for the full width of the dam wall.

Measurement and payment
The unit of measure will be per cubic metre of loaded rock placed into the water. The Contractor must provide photographic proof and the delivery notes with invoices to the Engineer.

PSDK GABIONS & PITCHING (SABS 1200 DK)

PSDK.1 Scope

This section deals with erosion protection, channel linings and riprap in various locations on site and is scheduled separately.

All gabions and revet ("Renno") mattresses to be according to SANS 1580:2020 Edition 1.3 with zinc coated mild steel wiring according to SABS 675 and Class A coating. The minimum woven wire mesh diameter for each location is stated below.

PSDK.2 Dam spillway protection

The gabions and mattresses to be installed as protection of the eroded spillway chute of the dam is against steep gradients with restricted access. The spillway may also be subjected to occasional flooding when the dam overtops. Refer to drawings No 102 for a 3D view of the spillway with gabion baskets in position.

The minimum wire diameter of woven wire mesh for gabion baskets and revetment mattresses is to be 3.0mm.

PSDK.3 Reinstatement of riprap

The work entails the reinstatement of riprap of the supply dam that is some 1,5km away from the hospital and accessible along jeep tracks that are steep and slippery when wet.

Revetment mattresses with a thickness of 500mm must be installed on the upstream embankment which has an approximate gradient of 1v:3h. The surface on which the mattresses are to be installed is prepared and measured under the section dealing with Earthworks (SABS 1200 D).

The bottom toe of the revetment mattress must be extended to at least 500mm below the water level at the time of construction. The rates must include for the placing of the revetment mattresses under wet and submerged conditions, which may require cranes or heavy lifting equipment. The Engineer must approve the methodology of installation in advance.

After installation of the mattresses, a toe anchor of dump rock must be placed which is described and measured under the section dealing with Small Earth Dams (SABS 1200DE).

Further to the above, the fencing around the dam will cross small water courses for which some gabion work for overpasses is required.

The minimum wire diameter of woven wire mesh for gabion baskets and revetment mattresses is to be 3.0mm against the embankment and around the dam for the river crossings.
Tendered rates also include for any laying dry or submerged works the Contractor undertakes.

PSDK.4 Hospital complex

The work is within the hospital boundary fence and is for the lining of stormwater channels, small outlet control structures etc. Access is generally easy, and topography is generally flat.

PSDK.5 Grass Block Linings

Where indicated, channels must be lined with flexible tied concrete grass blocks on geotextile after the channels have been neatly trimmed and compacted.

The linings are to be flexible of the “Armorflex” or similar type with thickness as stated with provision of holes for the stringing of wire for integrity and flexibility.

Tie wire must be galvanized to SABS 675 Class A with a minimum diameter of 3.0mm with mild steel galvanized anchor pegs at least 400mm into soil where blocks are against embankment or incline. Maximum gradients not to exceed 1:1,5.

Measurement and payment

The rates are fully inclusive for installation, including wire products, filling of cavities with 19mm crushed stone or G7 natural gravel, wire products and anchors. The unit of measure is per square metre of interlocked blocks in position. Earthworks and geotextile are scheduled separately.

PSDK.6 Grass Block Linings for stock drinking on dam edge

The access points for stock for drinking purposes to the dam must be lined with flexible grass blocks that have been pre-assembled to be lifted and installed under submerged conditions up to 1m under the water surfaces.

Further to PSDK.5, the tendered rates also include for the additional costs, lifting equipment and access to complete the installation.

PSG CONCRETE (STRUCTURAL) (SABS 1200 G)

PSG.1 Repair to end of sludge waste channel

The end of the sludge discharge channel has broken due to the rigid connection between the discharge pipe and the channel. The valve must be removed, and the channel end chipped end repaired with a wet-to-dry agent and non-shrink cementitious epoxy grout. The valve must be re-installed to be clear of the channel on four additional galvanized elbows which is scheduled elsewhere.



Figure 11: Sludge Discharge channel

PSG.2 Sludge waste channel repair

The contractor must break up a length of the plastered masonry sludge discharge shown in Figure 12. A sufficiently long part must be demolished to allow the installation of the stormwater pipe shown on the drawings.

The channel must be reconstructed to the original detail and levels, including plastering, keying of bricks into existing, 100mm concrete floor and benching to achieve the correct invert levels.



Figure 12: Sludge discharge channel near pipe crossing

PSL MEDIUM PRESSURE PIPELINES (SABS 1200 L)

PSL.1 Minimum Cover to pipes and Care

The minimum cover to all water pipes is to be at least 800mm in all instances, unless indicated otherwise on drawings.

PSL.2 Prefabricated circular potable water storage reservoir

A prefabricated circular potable water storage reservoir on ground level with minimum capacity of 260m^3 must be installed near the site of the existing elevated storage rank.

The minimum wall thickness of the upper 50% of the reservoir not to be less than 0.8mm and the lower 50% not less than 2.0mm.

The diameter of the reservoir is to fall within the limits of 7.0 to 8.0m. No limitation on the height.

Corrosion protection: Hot Dip Galvanized or Zincalume® AZ150 or better.
Lining: Approved lining suitable for potable water, 25year life span guarantee.

The following provisions for connecting pipework are to be made:

Connection	Position
150Φ flanged scour pipe, flanged	Floor
2 No 80Φ BSP screwed inside and outside (inlet)	Top
200Φ flanged outlet (fire) with vortex inhibitor	Bottom
150Φ overflow with insect proof gauze protection	Top
80Φ flanged outlet	Bottom

Flanges to be SABS 1123 Table 1600/3.

The following appurtenances are required as a minimum:

- Water level indicator
- Weather and waterproof roof
- Insect proof ventilation
- Ladder with safety cage inside and outside (Subject to safety height limitations for ladders)
- Lockable Access hatch

A manufacturer's guarantee of minimum 25 years is required against corrosion and weathering of linings.

The Contractor is to submit a specification of the reservoir he offers at tender stage.

The Contractor must submit the shop drawings of the tank and connecting pipework positions to the Engineer for approval prior to commencement of fabrication of the tank.

Measurement and payment

The tendered rates are fully inclusive for delivery, erection, disinfection, provision for connecting pipework, guarantee, etc.

The earthworks, concrete and reinforcing for foundations are provisionally scheduled under separate items under the relevant sections.

PSL.3 RECIRCULATION PUMP

A duty and standby submersible pump set with float type level controls must be installed on the floor of the existing ±2.5m deep underground raw water tank. The purpose of these pumps is to recirculate water in the fire storage tank to prevent stagnation.

This is referred to as pump No 1 on Dwg Nos 005 and R01.

The following is the specification:

Pump specification

- Medium: raw silty dam water.
- Pump type: Submersible centrifugal pump with float controls and stainless-steel housing with open type impeller arrangement.
- Pump Model: Grundfos Unilift AP12.40.04.A1
- $NPSH_A$: submerged
- Electrical motor: Single Phase 230V, 50HZ, 0.7kW
- Required pump duty point: 70kPa @ 1.0 lit/sec
- The pump motor must be equipped with thermal and electrical overload protection.
- Lightning and surge protection
- The pumps must be mounted with flexible hose connections to be lifted out individually for service and inspection. The "High" level sensor must however be mounted on a bracket that is not removed with the pump. Alternatively, the high-level float arrangement must not be altered in any way when the pump is retracted and submersed again after inspection.

Control Panel:

The following are specific requirements for the Electrical control panel and associated installations to control the pumps specified in the previous paragraph:

- The pump controls must include a manual override mode that allows manual switching on and off when within normal operating conditions in terms of level switching limits and pressure sensor signals from tank levels .
- Thermal, phase angle, overload and no- load protection.
- Ammeter & Voltmeter.
- Visual Fault condition indication.
- Pumps to be switched between duty and standby, controlled by an adjustable timer with 1h to 12h range. Please note that under normal circumstances the pumps are required to run continuously. Switch over from one pump to the other is therefore not necessarily preceded by an off signal as a default.
- Alternative pump to be switched on if fault condition on 1st pump is detected.
- Control panel to be mounted in a lockable corrosion resistant powder coated metal enclosure with IP55 rating against wall.
- The control panel to be mounted in the new plant room for pumping equipment.
- Pumps to be switched off by float level when minimum permissible level is reached in underground tank.

The above does not limit the specification to ensure safe and functional operations.

Measurement and Payment:

The relevant prices and tendered rates must collectively include the following:

- Complete control panel mounted in powder coated metal box in plant room.
- Connected to distribution board in pump room. Cable lengths of 20m is included in the rates.
- Pressure sensors, sensor cabling to control panel, cabling and mounting tray.
- Commissioning and Certificate of Compliance for the electrical installation by a registered electrical contractor.

PSL.4 FIRE BOOSTER PUMP SET

A duty/standby pump set with a jockey pump must be installed in the new plant room that will also accommodate other pump equipment and controls. The pump set must be compliant with UNI EN 12845 and of a brand that has a 10year track record in South Africa, with design and performance literature readily available for verification purposes. Remanufactured pumps of unknown brands are not acceptable.

The pumps set must be of modular construction, on pre-assembled skids with all controls, pipework, jockey pump and other appurtenances, to be mounted on concrete plinths.

This is referred to as pump No 3 on Dwg No's 005 and R01.

Feed to pump:
Water will be drawn from a 260m^3 storage tank of which the outlet flange level will be at least at the same level as the pump inlet flange. The water level of the tank will be full be at least 2,0m above the inlet flange at start up. The storage tank outlet flange will be equipped with a vortex inhibitor. The feeder pipe will have a nominal diameter of 200m and will not exceed 30m in length.

The pump setup must be according to UNI10779, A1.2 with an automatic stop and timer for hose reels and hydrants.

The pumps must be suitable for the following:
- Medium: purified water
- Source: Gound level storage tank (Min static head 10kPa).
- Pump type: Single stage centrifugal.
- Main pump Model: Grundfos EN-S2 80-200 JS-ASD-U1 or similar approved
- Jockey pump: Grundfos CM3-8 A-R-A-E-AVBE F-A-A-N or similar approved
- $NPSH_A$: 30kPa min available
- Electrical supply: Three phase 380V, 50Hz
- Motors: 2950 rpm IEC3 ±42 kW (to be confirmed by manufacturer)
- Required pump duty point: 550kPa @ 42.0 lit/sec

Pump operation:
- When discharge pressure drops, pressure switches automatically start the jockey pump, the 1st main pump, and, if necessary, the standby pump in cascade fashion to maintain the required minimum pressure of 550kPa.
- The jockey pump eliminates unnecessary starting of the main pumps by automatically restoring the pressure in firefighting system in case of leakage, but not in case of opening of a hydrant or sprinkler.
- The jockey pump is the only one which stops automatically by its pressure switch when the discharge pressure reaches the cut off value.
- The main pumps can only be stopped manually by using the appropriate button on the panel or automatic by a timer according to UNI 10779, A.1.2 for operation with hydrants and hose reels.

Pump installation:
The pump installation must include everything to comply with the stated specifications, including but not limited to:

- Pump bypass to prevent overheating when pumping against closed valve.
- Vacuum gauge on suction of each pump and pressure gauge on the delivery of each pump.
- All interconnecting pipework between jockey pump, duty and standby pump.
- Flow rate test loop with throttling valve
- Single combined PN 16 delivery flange
- One PN16 inlet flange per main pump
- Non-return valves, gate valves and compensation joints
- Diaphragm tanks
- Control panels in IP 55 enclosures
- Connection to future sprinkler system

Control Panel Function:

Enclosure	Powder coated mild steel, IP 54
Function	EN 10779, A.1.2
	Main Switch
	Ammeter and Voltmeter
Operation	Test-Off-Auto
Control Unit:	Start and Stop Button
	Pressure switch test for Pump 1 and 2
	LED signal test button
	LED power unavailable
	LED pump on demand
	LED pump running
	LED power at motor
	LED start failure
Outputs for remote monitoring:	Mains supply status
	Pump in operation
	Pump start failure

Prior to ordering, the Contractor must submit to the Engineer the detailed information and specifications of the complete pump installation..

Measurement and Payment:
The items scheduled for the fire booster pump installation, collectively covers everything required for the final installation, testing and commissioning. It also includes the isolation valves and non-return valves and pipework to be connected to a single ø200mm Table 1600/3 flange. Pipework up to the suction flanges are scheduled elsewhere.

PSL.5 ELEVATED TANK FEEDER PUMPS

A pump set consisting of a duty and standby single stage, centrifugal pump, end suction set must be installed with the other equipment in the new plant room to be constructed. The purpose of the pump set is to pump water from the storage tank on ground level into the nearby elevated storage tank that feeds the hospital.
This is referred to as pump No 2 on Dwg Nos 005 and R01. The following is the specification:

Pump specification

- Medium: potable water.
- Pump type: single stage centrifugal pump
- Pump Model:
- $NPSH_A$: 10kPa min available
- Electrical motor: Three Phase 380 V, 50Hz, IEC3 ±2,2 kW (to be confirmed)
- Required pump duty point: 200kPa @ 6.0 lit/sec
- Pump Type: Grundfos NK32-125 A2-F-K-E-BAQE to ISO 2858 or similar approved
- The pump motor must be equipped with thermal and electrical overload protection.
- Lightning and surge protection

Control Panel and pump operation:
The following are specific requirements for the Electrical control panel and associated installations to control the pumps specified in the previous paragraph:

- The pumps must be switched off when the elevated tank reaches full level. This must be done with a remote level sensor.
- The pumps must switch of when the water level falls below the domestic water outlet level. This must be controlled with a level sensor in the fire tank.
- The pump controls must include a manual override mode that allows manual switching on and off when within normal operating conditions.
- Thermal, phase angle, overload and no- load protection.
- Ammeter & Voltmeter.
- Visual Fault condition indication.
- Pumps to be switched between duty and standby, controlled by an adjustable timer with 1h to 12h range. Switch over from one pump to the other is therefore not necessarily preceded by an off signal as a default.
- Alternative pump to be switched on if fault condition on 1st pump is detected.
- Control panel to be mounted in a lockable corrosion resistant powder coated metal enclosure with IP55 rating against wall.
- The control panel to be mounted in the new plant room.

The above does not limit the specification to ensure safe and functional operations.

Measurement and Payment:
The relevant prices and tendered rates must collectively include the following:

- Complete control panel mounted in powder coated metal box in plant room.
- Connected to distribution board in plant.
- Level sensor cabling to control panel, cabling and mounting tray.
- Commissioning and Certificate of Compliance for the electrical installation by a registered electrical contractor.

PSL.6 Welded manufactured steel pipe fittings:

Welded manufactured steel pipe fittings must be to SANS 62 Medium Class or SABS 719 Grade B. Working pressure of all fittings to be 1600kPa.

Pipes must be coated with "3M SchotchKote 162 PWX" or similar approved epoxy coating to 500µm coat thickness.

The details and extent of the manufactured fittings are shown on the drawings and pipe schedules. Dimensions must be confirmed before ordering to suit dimensions of the special fittings and actual dimensions on site.

Trial assembly must be made before fittings are fastened into final positions and cast in. Any fittings that are misaligned or causing specials to be out of plane or vertical must be replaced.

Payment and measurement:

The prices for cut lengths of pipe scheduled are fully inclusive for cutting and wastage, regardless of lengths. The lengths will be measured along the centre line of the pipe with no deduction for flanges and packings. The dimensions of special fittings will be deducted. In the event of bends and reducers, the pipe length will be measured along the straight centre lines up to the intersection points of straights.

Reducer, and T- piece intersections will be measured by number as extra over and must cover the cost of cutting and welding.

The prices for all manufactured fittings include for protective coatings.

PSL.7 Special fittings:

The specification sheets of all special pipe fittings must be submitted to the Engineer prior to ordering for written approval. The working pressure of all specials must be 1600kPa unless specified otherwise.

All gate valves must to SABS 664 with non-rising spindles, handwheels, right hand closing.

PSL.8 Valve chambers:

Valve chambers are to be built of hard burnt NFP grade 220mm brick walls in English Bond, 12mm plastered inside and visible surfaces outside.

Floors are to be of 125mm 25 MPa concrete and to be 100mm larger than the chamber outside walls with Ref 193 mesh midway in the depth of the floor.

Concrete slabs and collars are to be 125mm thick with chamfered corners with Ref 193 mesh in the bottom of the slab with 40mm cover to the soffit.

Step irons to be installed when the depth of the chamber is more than 1m at a vertical spacing of 300mm.

The rates are fully inclusive in accordance with Clause 8.2.14 of SABS 1200 L and the above requirements. The rate must also include for any additional excavations and backfilling, over and above the normal trench excavations.

Measurement and Payment
The depths stated is measured from the soffit of the cover to the top of the floor. The rates are fully inclusive as described.

Extra over items are measured that covers the cost of chambers and manholes larger than the stated sizes.

PSL.9 Filter room equipment

When the new Water Treatment Plant is fully operations, the Contractor must dismantle and remove all the pipework and equipment off site.

All motors and pumps remain the property of the Employer and must be delivered to his stores.



Figure 13: Filter equipment to be removed

Measurement and Payment
This item is paid as a Sum of all labour transport and tools dismantle and remove the equipment.

PSL.10 New pipe installations around hospital complex

The existing asbestos-cement reticulation system around the hospital will be abandoned after a new system has been installed. Furthermore, a new fire reticulation system will be installed around the hospital to which fire hose reels will be connected.

The new system must be installed and tested before any connections to the buildings are made,

The installation of the be pipes will be near buildings and in courtyards where excavators will not have access. It will also be in and amongst other services which will impact on work.

The work will also entail the location and uncovering of existing connection pipes to existing buildings to be connected to the new reticulations system.

The rates and prices is deemed to include for the work under these circumstances and must include for all additional cost in this respect, e.g. hand excavations of trenches, breaking up of hard rock with pneumatic tools or mechanical hammers etc.

PSLB BEDDING (PIPES) (SABS 1200 LB)

PSLB.1 Bedding Type

Bedding for flexible pipe, e.g., uPVC and HDPe shall be to Drawing LB-3 (d) in SABS 1200 LB

Measurement and Payment
The quantities for Compacted Selected Fill Blanket and Bedding Cradle of Compacted Selected Granular material will be calculated in accordance with Drawing LB-2 (a) for flexible pipes.

PSLD SEWERS (SABS 1200 LD)

Scope

The existing sewer infrastructure was installed under a previous contract, but the compliance with specifications was never verified. After completion of the CCTV inspection and submission of report as described in the Particular Specifications, the Engineer will instruct the extent and scope of the repairs to be carried out.

This section must also be read in conjunction with the Particular Specification BSG.

PSLD.1 Dealing with sewage flow

Where repairs are to be done on sewers that are active, the contractor will be required to accommodate the flow.

Where the repairs can be done by temporarily blocking of sewers and manholes upstream of the repair, the rates are deemed to include for the control of flow.

Where the temporary blocking is not possible and sewage has to be diverted via a bypass, the contractor must make use of submersible pumps and flexible hoses to divert the flow to the next manhole or access point.

The Contractor must submit his programme and methodology to the Engineer for approval prior to the commencement of work.

Measurement and Payment
The tendered rate for diversions will be paid per sewer run between manholes where a diversion is required. In other words, where more than one point of repair is required between manholes, the contractor will be remunerated once, regardless of how many times or the duration of the repair.

When this length between manholes exceeds 50m, it will be considered as and additional run for every 50m or part thereof.

The rate does not apply to work on soil and waste pipes that is a branch of a sewer that connect to above-ground sanitary fittings. In these instances, the applicable rates are deemed to include for dealing with effluent.

PSLD.2 Manholes

All brick manholes to be constructed with cement or clay bricks with 14MPa compressive strength and in English bond.

PSLD.3 Replacement of existing sewers

After the completion of the CCTV sewer survey, the Engineer will instruct the Contractor to replace sections of sewers that have been found to be misaligned or deficient.

The sewers to be replaced are close to hospital buildings and in courtyards that are not accessible for heavy equipment.

The relevant Items for replacement of sewers must allow for the careful taking apart of existing sewers and their connections, installation of new sewers in cut lengths and re-assembly.

The contractor must liaise with the management of the hospital for the temporary commissioning of sanitary fitting in order to allow the replacement of sewers.

Measurement and payment
The relevant rates cover all cost of working under these conditions, including co-ordination, temporary disruptions, cut lengths of sewers etc. Repair couplings will be measured separately.

PSLE STORMWATER DRAINAGE (SABS 1200 LE)

PSLE.1 Pre-Cast Headwalls

Pre-cast head walls are to be Rocla units as per Catalogue: February 2015. The units are to be installed in accordance with the specifications of the manufacturer.

Care must be taken that the pipe culvert ends do not touch the headwall aperture prior to grouting up.

Should the Contractor wish to construct them in-situ the following must be met:

- Concrete Strength to be 30MPa
- All corners to be chamfered 20x20mm
- The minimum thickness of floors to be 200mm
- The minimum thickness of walls to be 150mm
- Internal dimensions (side of water contact) to be equal or exceed the dimensions of the Rocla units in all respects.
- Minimum cover to reinforcing to be 40mm.
- Reinforcing to be at least 0.15% of cross-sectional areas in all directions both faces.

Measurement and payment
The tendered rates are fully inclusive for delivery, preparation of and compaction to 93% of surfaces, flowable grouting, epoxy mortar to collar and cutting of end of pipe culvert.
Excavations and backfilling measured in Section D Earthworks under restricted excavations. The unit of measure is per headwall unit.

PSLE.2 Manholes

All brick manholes to be constructed with cement or clay bricks with 14MPa compressive strength and in English bond.

PSMJ SEGMENTED PAVING (SABS 1200 MJ)

General

The applicable standard for Segmented Paving Blocks will be SANS 1058:2012 in lieu of SABS 1058.

PSMJ.1 Class and Strength

Delete the stipulations in Clause 3.1.2 in terms of strength.

The strength classes and methods of testing according to SANS 1058:2012 will apply.

PSMJ.2 Degree of accuracy

Clause 6.2: Degree of accuracy I will apply. Deviation (2)(ii) to be +7-10.

TAFALOFEFE HOPITAL: WATER AND WASTEWATER TREATMENT WORKS

CONTRACT SCMU5-24/25-0037

PARTICULAR SPECIFICATION: CIVILS & M&E

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BSA: WASTEWATER TREATMENT PLANT

SCOPE

This section deals with specialized components required to complete the sewage treatment plant. Most of the structural components have been completed. Civil components like site services, stormwater etc, are to be completed with and is dealt with under Portion 2 of the Project Specification. The electrical installations are dealt with separately under Portion 3 of the Project Specification and Schedule 4 of the Schedule of Quantities.

BSA.1.1 General

This Particular Specification deals with the following components of the sewage treatment plant required to achieve completion and commissioning:

- Blowers and Motors
- Compressed air supply lines
- Commissioning of the Plant
- Training of Plant Operators Provided by Department of Health
- Commissioning and Testing

BSA.1.2 Existing components:

The following components **have been completed** under a previous contract:

1. Inlet screen
2. Main reactor containing the disinfectant neutralizing tank and clarifier.
3. Chlorine contact channel
4. Plant room for blowers (to be finished off).
5. Small building to house chlorine dosing equipment.
6. Sludge discharge lagoon (existing oxidation ponds to be used for this purpose)
7. Lined maturation pond.
8. Sludge discharge channel from clarifier to sludge lagoon
9. Discharge pipe from reactor to maturation pond
10. Bypass discharge pipe from maturation pond to chlorine contact tank.
11. Final discharge pipe

The site layout and the “As-Built” drawings of the above are attached under Drawing (Refer to list of Drawings.).

Please note that some renovations and civil work is still required. This work is measured accordingly in the Schedule of Quantities.

The building to house the blowers and controls has internal dimensions of 4,0x5,0m with a clearance of 3,4m to the soffit of the concrete roof.

BSA.2 TESTING AND QUALITY

Over and above testing and quality control required in the Standard Specifications (SABS 1200), all materials to be used for the completion of the works must comply with the applicable standards and requirements of the South African Bureau of Standards or SANS. In the absence of these marks equivalent ISO or CE quality mark will be accepted.

The contractor must compile a full quality assurance plan and submit it to the Engineer for approval before construction commences.

The plan must include the following:

- Testing of coating film thicknesses.
- Testing of welds
- Testing of mechanical equipment, including vibration and balance testing.
- Leak testing of pressurised lines
- Testing of electrical systems, including earth leakage systems and phase balancing.
- Testing of oxygen transfer rate to prove the aeration system meets the performance specifications.

All quality control tests will be executed at the cost of the contractor. Costs of the tests required are deemed to be included in the rates of the items that are subject to testing.

Test results must be supplied to the Engineer immediately after they have become available.

Certificates of Compliance and/ or Testing Certificates must be submitted to the Engineer upon completion of a particular component.

BSA.3 GUARANTEES, SERVICING AND COMMISSIONING

The Contractor is required to provide guarantees that is effective for up to the Final Completion date. This date is the latest of the end of the Operation and Maintenance (O&M) Period or the 12month Defects Liability period. The responsibility of all maintenance and repairs relating to workmanship and warranties will remain with the Contractor up to the latest of these dates.

By the end of the commissioning period the plant must have been operating continuously and reliably for at least 30 days.

The normal 12month Defects Liability Period of the Contract will commence on the date of Practical Completion of the entire Contract. On this date the O&M period commences.

Should the O&M terminate sooner than the 12month Defects Liability Period the close out provisions of the O&M period will still apply. The Contractor must then service all equipment and replace parts and components that are worn or subject to wear that require scheduled replacement that falls within the ambit of the age of the equipment at that stage. Any scheduled maintenance items listed by the manufacturer that will be due within 3 months must also be done. This includes drive belts, filters, and the likes. Any components showing signs of deterioration must also be replaced, e.g., cracked hose connections or leaking gate valve seals and spindles.

A final inspection will be carried out by the Engineer after the above work has been completed for approval of the state of repair of the plant.

A close out document must be submitted at this stage that contains all records kept during the Defects Liability Period or O&M period, including reports and laboratory test results.

BSA.4 DESIGN

BSA.4.1 Equipment Design

The Engineer has designed an extended aeration activated sludge sewage treatment plant and the associated components, including a circular concrete reactor. Refer to Dwg No E765-109 for the process flow diagram and BSA.5 below for further design parameters. Also refer to Dwg No E765-105 that shows the scope and extent of pipework and other equipment.

The Schedule of Quantities indicates proposed capacities and sizes for the blowers and the motors, and sizing of air pipework. The Contractor must verify these to match the fine bubble diffusers and air-pipework that they propose to install.

Note: During tender stage, the Tenderer must complete the relevant forms and attach the specification sheets of the blowers, motors, air pipework and bubble diffusers.

The equipment offered must comply with this project specifications and design data provided and must include the submission of equipment designs, literature, shop drawings, drawings and operating and maintenance manuals.

The shop detailing and equipment selection must include the following, but are not limited to:

- All air supply pumps, air supply lines and connections.
- Air pipework and dropper pipes. For aeration system, MLSS, RAS and WASML and scum removal system.
- Mechanical and electrical systems and their controls.
- Chlorine dosing system.
- V-notch flow measurement system and recording device in chlorine contact channel.
- Wiring design of blower control panel and electrical installations.

Please note that the hydraulic pipework that conveys liquids has been completed under a previous contract.

Measurement and Payment
The relevant prices and rates are fully inclusive to cover the cost of the above. Rates and prices will not be adjusted if the capacities of the blowers and motors and pipe diameter differ from the preliminary sizing of the Engineer.

BSA.4.2 Control Panels

The Contractor must configure all electrical control systems for the effective and reliable operation of the extended aeration activated sludge sewage treatment works in accordance with the Project Specification and Particular Specifications, including the submission of any necessary equipment

designs, shop drawings and operating manuals, including servicing schedules.

The submission must also include the determination of cable- and wire types and sizes between the Distribution Board and the Blowers.

The Contractor is also responsible for the electrical cabling installation of the 3 Phase 380V underground cable from the nearby Substation/ LV room which is from the existing hospital LV room and is covered in Portion 3 of the Project Specifications.

BSA.5 DESIGN DATA AND CONFIGURATION

BSA.5.1 Origin of Sewage

The sewage to be treated originates from Tafalofefe Hospital a 140 bed rural hospital with a kitchen and laundry. All effluent will be gravity fed to the works.

BSA.5.2 Sewage Load

The raw sewage load to be treated is as follows:

- Average daily flow 150 m³ /day (1.7 l/s)
- Peak wet weather flow 300 m³ /day (4.2 l/s)
- Average BOD 50 kg BOD/ day
- Elevation above sea level 380 metres

It must be noted that flows are variable due to the availability of water etc., and may be significantly less at some stages.

BSA.5.3 Plant Type

The plant is an activated sludge extended aeration system, capable of treating the required volume of sewage under gravity and to discharge an effluent to the adjacent natural watercourse that complies fully with the requirements of the latest amend of the National Water Act, 1998, especially the General Authorisation requirements of effluent quality.

The internal recycle rate of MLSS must be adjustable with a gate valve as control. The liquid pipework for this has been installed and the supply of air for the air lift activated sludge return must be still be installed.

BSA.5.4 Location of the plant

The plant is situated near the hospital in a fenced area adjacent to the existing oxidation ponds within the grounds of Tafalofefe Hospital.

BSA.5.5 Point of Discharge

The effluent from the plant discharges from the chlorine contact channel into a maturation pond and then into a water course. The inclusion a maturation pond in the process is not intended to be necessary as port of the system to achieve effluent standards, but as a buffer in the event of emergencies.

BSA.5.6 Electrical Supply

Refer to Portion 3 of the Project Specifications and Schedule 4 for Schedule of Quantities.

BSA.5.7 Electrical Installations for Mechanical Equipment

All electrical control panels and distribution boards to be surface mounted against the interior wall of the of the blower room. All cabling between motors and panels to be secured to cable trays and elevated above floors and at heights that will not be a trip hazard or obstruct floor areas to be kept free of obstructions, e.g., access to panels and escape routes to doors.

Underground cabling routing and sensor cables to and from the blower must pass through long radius sleeves into the building and protected in suitable wall mounted metal housings or ducting.

All units to be fitted with lightning protection arrestors mounted in the control panel.

The distribution board, internal lighting, power points and earthing is covered in Portion 3 of the Project Specification.

BSA.5.8 Blower Control Panel

The control panel must be constructed and finished (colour orange textured powder coating) to the approval of the Engineer of metal plate not thinner than 2.0mm. The main isolator and individual circuit breakers shall be mounted in the control panel for isolation and protection of the power and control circuit. The control panel shall meet IP 55 requirements.

The Contractor must supply correctly rated switchgear and cabling (AC 3 duty) for the units offered. Push-button switches, contactors, relays and starters shall be of well known, industry standard types by reputable manufactures. In order to simplify maintenance and repairs, the component of the panel must be of types that can be easily repaired, be standardized off-the-shelf that can be easily sourced from regular local stockists. Controllers panels that can only by repaired by specialist designated by the manufacturer or importer will not be acceptable.

The control panel must include the following:

a) The blowers must run on a duty/ standby basis of which the switch over is controlled by an adjustable timer with limits between 30min and 12h.
b) A manual override mode to override the automatic mode.
c) Hour meters for each motor to be installed for each blower set.
d) Indication lights for pump on, pump stop, pump trip.
e) Power supply status indicator lights.
f) Overload protection, phase angle protection and thermal protection.
g) Safety cut-outs.
h) Temperature cut-out for over-temperature of blowers
i) Lightning protection

j) Voltmeter with a selector switch to measure the supply voltage on each phase.
k) Ammeter.
l) Earth leakage protection

Refer to Portion 3 of the specification for the requirements for remote monitoring of the functioning of the status of power supply, panel fault status and blower status. Portion 3 of the Project Specifications also contains further requirements for cabinets, wiring standards and other specification pertaining to quality.
Refer to the relevant electronic specification for the requirements for remote monitoring of the functioning of the status of power supply, panel fault status and blower status. The specifications also contain further requirements for cabinets, wiring standards and other specification pertaining to quality.

BSA.5.9 Air Blower Units

The Contractor must supply and install two sets of blowers with motors to operate on a duty/ standby-by basis. The preliminary sizing of the Engineer for the blowers and motors are Aerzen GM 3S or similar approved positive displacement blowers, driven by 2950rpm 380V 50Hz ±5.5 kW electrical motors and drive belts.

The coupling of the motors to the blowers are to allow for the reduction of air delivery volumes to cater for potentially lower volumes of effluent to the plant initially.

Delivery water depth is 4.0metre.

The motors to have and ingress protection grading of IP55 rated with IEC 3 (High Efficiency) according to IEC 60034-30-1, and mounted on a frame with vibration insolation mounts. Motors must comply with BS EN 60034-1:1995: Rotating Electrical Machines, Rating and Performance. Motor to be mounted on hinged motor plate as belt tensioning control.

Aeration blowers shall be of the positive displacement type, operating at speeds less than 1800 rpm and fitted with a discharge silencer to attenuate noise. Blower/ motor sets must be mounted in acoustic hoods. Allowable sound level must be less than 70dBA at 3m distance.

Each blower must be provided with the following:

- Isolation valves
- Check valves
- Adjustable pressure relief valves.
- Inlet and discharge silencers and separate inlet filter.
- Secure blowers to equipment pad with vibration isolators and anchor bolts.
- Over-temperature sensors to blower.
- Pipework from blower outlets must be connected via a steel reinforced flexible rubber connector.

The supplied air shall be diverted through a suitably sized and constructed air-supply manifold to all use points. The manifold shall be fitted with all necessary valves to direct flow and isolate supply to any point of use to allow separate repair.

Provide a 100mm diameter damped pressure gauge with stop cock on the common discharge header pipe.

The blowers and motors specified in this Particular Schedule of Quantities are indicative only. The Contractor must confirm the sizes of motors and blowers to be correctly matched up with the fine-bubble diffuser arrangement with the following performance specification:

PERFORMANCE SPECIFICATION	
Altitude	380 m above sea level
MLSS	3500 mg/l
Sludge age	20 - 25 days
Peak oxygen requirement	17 kgO_2/h
Peak air requirement	150 m^3/h
Number of Diffusers	2 + 16 = 18 (mounted on 10 dropper pipes)
Residual Dissolved Oxygen at all times	1.5 mg/l

Blowers and electric motors must be mounted on separate detachable galvanised mild steel frames.

The effluent quality from the plant, must comply with the General Standards as determined by the National Water Act, Act 36 of 1998.

The plinths must be constructed by the Contractor, of which the design and sizes are to be approved by the Engineer in advance. The bases must be suitable to safely accommodate the loads and vibrations imposed by the blowers and motors. Construction of the plinths are scheduled separately in Schedule 2.

The blower- and motor units shall be supplied complete with all equipment necessary for continual operation to supply the full air supply to the plant and shall include, inter alia, drive motor, drive pulley and belts, intake manifolds, air filters, electrical control panel, lubrication systems, silencers, and hoods etc, complete as described above.

The details, capacity and product brochure of the complete blower sets of the blower sets must be included in the tender as an attachment to the relevant Returnable Schedules.

BSA.5.10 Air Supply

Air supply system must comply with the following requirements:

- Pipes to be seamless Grade 316L stainless steel pipes to ASTM312 Schedule 10.
- Pipes to be joined with BSP screwed Grade 316 stainless steel fittings to ANSI B16.3.
- Provision must be made in the layout and fixing of air pipe work to accommodate thermal expansion and contraction.
- Provision for galvanic corrosion protection must be made at the connection with Galvanized steel pipes and supports by controlling contact areas or by insulating.
- The completed installation must comply with SANS 347:2012 and a certificate of compliance must be issued by a competent person if the Hazard Category requires it.

Preliminary pipe diameters:

Preliminary pipe diameters for air supply lines, air lift and return pipes have been indicated on the drawings as a proposal. The design of the Contractor may deviate from the indicated diameters to suit the equipment offered. The tendered rate is deemed to include for the diameters required by the actual installation. Any deviations must be described in the tender, and the financial implication priced into rates.

Air pipe arrangement:
The supply line from the blower will feed to the reactor into a 100ø circularly arranged manifold mounted on supports to be suspended above water level and provided by the Contractor. The total circumference of the circular manifold is 16m. A proposed arrangement of the above is shown on the drawings.
Individual stainless steel dropper pipes must branch of from the circular manifold to feed fine-bubble diffusers located at a nominal depth of at least 3.7m below top water level. The design of the aeration system and the number of diffusers shall be determined by the contractor and approved by the Engineer prior to installation. Allowance has been made for 18 No as shown on the drawings, of which two is mounted in the antiseptic neutralisation tank.

It is important to note that diffusers must be mounted in positions under the slanted baffle soffit to facilitate proper mixing and circulation.

The Contractor shall satisfy the Engineer that the air delivery of the blower units is adequate to supply air to effectively operate the following components:

- Aeration and mixing capacity for reactor.
- RAS delivery from the clarifier to the reactor and MLSS recycling
- Sludge wastage to sludge discharge point to sludge lagoons
- Scum removal from the clarifier

The intended levels and configurations of the above are shown on the drawings.

The main air supply pipe may be placed above ground provided that it is supported at 1.5 m centres on firm bases and protected against corrosion and damage. Where the air supply pipes pass through the structures, provision must be made that pipework is isolated for the purposes of protection against thermal movement, heat transfer and vibration and chafing.

BSA.5.11 Diffusers

All aeration drop pipes shall be Grade 316 Stainless Steel pipe. PVC is not acceptable for aeration dropper pipes. Each diffuser drop pipe assembly shall consist of a union to allow for ease of removal, a lever operated 316SS ball valve accessible from the walkway for the purpose of shut off and regulation of air supply, and the necessary pipe and fittings.

Each diffuser assembly shall be easily removable from the tank manually and by a single person.

Diffusers must have a proven performance and reliability and be of the fine-bubble type of a reputable and well-known manufacturer in South Africa with representation in the country for more than 5 years. The diffusers are required to support an air throughput of between 3 and 20 cubic metres per hour at depths of 3.7 metres.

BSA.5.12 Air Supply to air lift and Sludge Discharge

The air supply to the air lift for activated sludge return and sludge wasting to sludge lagoons is a shared connection to the liquid conveyancing system.

The Contractor must make the connection to the threaded nipple provided which is located 1.6m below ground level just outside the concrete reactor. This air supply line shall be controllable with a ball valve on the supply line.

The air pipes are to be securely fixed to the treatment works and all horizontal pipe work is to be supported at 1.5 m intervals. The air lift pipes are to have a free discharge to the reactor and units are to be accessible for periodic cleaning.

The pipework and control systems for the air lift pumping of waste activated sludge to the discharge point near the main reactor forms part of the stainless stell air pipework to be installed. The Contractor must excavate around the existing sludge discharge pipe to uncover the nipple for the connection of the airlift pipework.

BSA.5.13 Chlorination

The masonry chlorine building to be refurbished under this Contract has internal dimensions of 1.8x2.0m and clearance of 2.44m to the soffit of the concrete roof. A security gate is fitted to the building to facilitate ventilation.

A liquid based HTH Chlorination system approved by the Engineer shall be installed. The contractor is required to install a suitably sized 220V single phase 0.18kW dosing pump complete with PVC head, valves ad PTFE diaphragm which is mechanically activated with built-in over pressure valve. The pump is to be manually adjustable between 10 and 100 % and must be wall mounted.

The units are to be installed complete with all fittings including DN 8 installation set (foot valve, suction line, level switch for empty indication and 10 metre delivery line with injection point).

The mixing tank for the chlorination system must consist of a dual tank system where the mixing takes place in the 1st tank from which is then conveyed to a 2nd tank from which the mixture is withdrawn by the chlorine dosing pump. This is required to prevent fouling of the pump with sludge and solids. 235 litre polypropylene tanks are to be installed complete with connecting pipework and valves and fitted with a tank mounted electrical axial flow type mixer (0.75 kW 240 V single phase). The shaft and impeller are to be PU rubber-coated stainless steel.

The connection for water supply to the chlorine dosing plant is measured as e separate Item under Schedule 2.

Measurement and Payment
The relevant prices and rates are fully inclusive for the complete design, delivery, installation, and commissioning of the equipment as described above.

BSA.6 ELECTRICAL INSTALLATIONS

Please note that all electrical installations are to comply with specifications relevant to Portion 3 of the Project Specification and is measured in the Schedule 4 of the Schedule of Quantities. Some components like motors, control panels, flow measuring, and logging equipment forms part of Schedule 2 as covered before.

BSA.7 FLOW MEASUREMENTS

The effluent flow meter must be installed near the overflow weir of the chlorine contact tank. Electronic equipment will be housed in the chlorine hut. Equipment must be resistant to the corrosive environment that may exist there.

An ultrasonic transducer flow meter in combination with a 3-CR12 V-notch overflow weir plate mounted to the overflow wall of the chlorine tank is required.

The flow meter must be coupled to a data logger with volume integrator that gives a real time digital reading of flow rate and total flow volume measured.

The equipment provided must be from a manufacturer that has a well-known with a long-standing reputation in flow metering technology.

The V-notch arrangement must be optimized to best suit the range of flow rates expected. These calculations must be submitted to the Engineer for approval.

The equipment must be insulated from electrical surges from the electrical supply, lightning or otherwise.

The level censors must be mounted in a way that will make it resistant to vandalism. All equipment must be in IP68 housings.

The data logger must be of a type that can be interrogated by software supported by Mac or Windows 7 operating system. There must be no restrictions on the availability of required software in terms of stations and users. Connector cables must be industry standard like USB cables that are readily available. (Any laptops required will be supplied by the Engineer). Data files must be exportable to Excel, or normal *.txt files (Notepad)

If at any time during the Defect Liability Period, any component of the flow metering system proves to be unreliable or unsuitable, it must be replaced with a reliable component, at the cost of the Contractor.

A local supplier with the infrastructure and the knowledge to service and support the flow meter system in all respects (hardware and software) must be accessible to the Engineer and the Client during and after the Defects Liability Period.

The prices and rates for must be fully inclusive for all components, installation, calibration, training of the engineer, software, cables etc.

BSA.8 CIVIL WORKS

The Civils pertaining to Mechanical and Electrical installations are covered in Portion 2 of the Project Specifications and as follows:

- Trenching for cables and air pipework, including backfilling and compaction.
- Minor building works, like making openings in building structures to pass services through.
- Concrete plinths for blowers and motors are scheduled separately.
- Civil works e.g., trenching for cables form part of the electrical installations and must be priced accordingly.

BSA.9 MANUALS AND DIAGRAMS

Four copies of the manuals are to be provided by the Contractor. The manuals are to be neatly bound in plastic-covered clip files or in ring-bound form. The following is an overall summary of the required contents of the manual:

- A flyleaf giving the works name, the names, addresses, telephone and fax numbers of the Contractor, the mechanical and electrical equipment and control board manufacturers.
- A summary page of duty points, power, voltage and ampere values of all components.
- Pump head/flow/efficiency/power curves.
- Comprehensive operating instructions and fault-finding guide.
- Comprehensive operating instructions including recommended servicing and replacement intervals for any components subject to wear and tear.
- Wiring diagrams.
- Schematic “as-installed” drawings of the control panel.
- Schematic “as-installed” drawing of the plant layout, including full descriptions and specifications of all installed equipment.
- Manufacturer’s brochures, specifications, drawings.
- Spares manuals.
- Fault finding schedule for all equipment and the process itself.

A draft copy of the above manual is to be submitted to the Engineer for comment and approval, before the commissioning of the works.

<u>Wall Mountings Diagrams:</u>
Copies of the following are to be wall-mounted in the blower room and chlorine hut in frames or mounted on 2,0mm aluminium plates and protected with a UV resistant laminate:

- Wiring diagrams.
- Abbreviated Operating instructions
- System layouts/ diagrams.

These copies are to be printed with certified UV resistant ink to not fade over time.

BSA.10 CORROSION PROTECTION OF METALWORK

BSA.10.1 Stainless steel and 3 CR12

Great care shall be taken not to contaminate the stainless steel / 3CR12 items with iron or mild steel particles.

Stainless steel / 3CR12 parts shall be kept physically separated from any mild steel fabrication in the manufacturer's workshop such that grinding particles and the like cannot contaminate the stainless steel / 3CR12 items.

Tools and grinding wheels used shall be kept separate from those used for mild steel fabrications. Brushing shall be with stainless steel brushes only.

All tools used for cutting, grinding, brushing, or machining of the stainless steel / 3CR12 shall be dedicated to use on stainless steel / 3CR12 only.

Any parts that have been machined shall be passivated.

Before commencing welding of stainless steel /3CR12 items the Sub-Contractor shall notify the Engineer in writing of the type of electrode or welding rod he proposes to use.

The Engineer's written approval for the same shall be obtained before welding commences. Standard stainless steel welding practices, as recommended by SASSDA, shall be employed.

Finished welds shall be thoroughly cleaned and passivated.

BSA.10.2 Galvanic Corrosion: Stainless Steel to Galvanised Iron

Where stainless steel components are in contact with galvanized steel components, care should be taken to prevent galvanic corrosion between the components by isolating or other means.

BSA.10.3 Exposed Walkways, Handrails and Surfaces exposed to external abrasion.

Walkways, handrails, air pipes and risers and all surfaces exposed to external abrasion will be galvanised to SANS 121:2000 and ISO 1461:1999 by complete immersing in a zinc bath to produce a smooth uniform finish with a dry film thickness of 85µm. Coastal application will apply to this installation.

BSA.11 GENERAL REQUIREMENTS

BSA.11.1 Testing of welds

Welds on and off site will be done neatly and along straight lines, welds that are not correctly executed shall be neatly grinded to expose the affected area and redone were required.

All on site welding will conform to the requirements of the SABS 455 and SABS 044 with sections pertaining to this application.

All welds are to be tested along approved acceptable methods by an independent approved specialist,

resulting in the issue of an approval certificate (Paraffin Method or similar).

BSA.11.2 Technical Details of Equipment

The successful tenderer is required to submit full working drawings of the installations to the Engineer for approval before fabrication commences.

No changes to the equipment specified in the schedules will be allowed without written approval from the Engineer. Changes instructed by the Employer that result in a saving will accrue to the Employer. The Employer will not be responsible for additional costs of a change due to oversight, mistake on the Part of the Contractor or change of circumstance that is not an Accepted Risk, unless the client directs the change. Where equipment specified is under-designed or deviates from the required specification the contractor shall make changes as directed by the Engineer with no cost penalty to the client.

BSA.11.3 Material selection and principles

As far as possible, materials resistant against corrosion by the sewage, chemicals and operating environment shall be used. Where this is impractical, suitable approved corrosion resistant coatings shall be applied as specified in the section on Corrosion Protection. Bi-metal junctions shall be avoided, or satisfactory steps shall be taken to obviate the electrolysis effect from this cause.

BSA.11.4 Protection of moving parts

Moving parts, chains, electrical motors, and electrical switchgear (if any) shall be suitably enclosed or sealed against the ingress of chemicals, dust or liquids as appropriate to the working environment. Assembly of equipment shall be such as to facilitate repairs and the replacement of wearing parts.

BSA.11.5 Indicator Plates

Approved indicator plates, for identification and operational purposes, shall be supplied and conspicuously fixed on all equipment and valves.

Indicator plates that are externally mounted and subject to corrosion must be fully corrosion resistant and lettering must be engraved, all with an expected life span of 25 years.

BSA.12 COMMISSIONING

The new plant will be installed alongside an existing plant (oxidation ponds) that will become redundant once the new plant becomes operational. The existing oxidation pond system will be incorporated into the activated sludge treatment plant as sludge lagoons and maturation ponds. During the construction phase it will be required from the Contractor to keep the existing plant operational until switch over can be established. This must be planned properly. (Refer to the site layout of the works to establish the implications and extent of this.)

Once the new plant is ready to be commissioned, the Contractor shall notify the Engineer.

In terms of the Contract, Practical Completion will have been achieved when the plant has been operating successfully for 3 months. Also refer to BSA.3.

After filling and pre-testing of the plant, sewage will be diverted to the new works for treatment. The

date of the start of commissioning period shall be the date of first initiating treatment, with the proviso that the Commissioning Period shall not be considered complete until the plant has supplied a final effluent in full compliance with the requirements of the General Authorisation issued for the works for a continuous period of 30 days measured from day 60 onwards.

The contractor shall bring the new sewage treatment works to full operation while training staff provided by Department of Public of Health in the operating of the unit. After 30 days the plant shall be sampled at the inflow, aeration tank, sludge return and discharge from the chlorine contact channel at weekly intervals and samples tested.

During commissioning of plants, the contractor will be required to provide staff to train and direct staff the staff of DoH. The frequency and duration are not specified, but at the end of the commissioning period, the trained staff will be required to autonomously operate the plant, including decisions making, fault finding, record keeping etc.

The samples must be subjected to a full sanitary analysis and a process assessment will be made. The results must be used to make the necessary adjustment of the plant operation. This process of sampling must be maintained for a further 60 days to confirm that the commissioning period has been successful, or until the plant is deemed to have been commissioned successfully.

The basis of the testing progress during commissioning shall be based on no less than five samples sets submitted to the laboratory approved by the Engineer at 7day intervals.

The effluent quality must comply with the General Standards as determined by the National Water Act, Act 36 of 1998.

During the commissioning phase of 90 days, the contractor shall, inter alia, undertake the following:

- Set up the plant to treat effluent supplied from the outfall sewer.
- Compile reports of the actions taken in the first 3 months with regards to training, operation, and quality control at the works. The report includes on any issues that may impact on the Employer in respect of suitability of staff or additional training requirements.
- Compile fortnightly reports on the performance of the works for the duration of commissioning period.

BSA.13 LABORATORY TESTING

The laboratory that the Contractor will assign to carry out testing must be independent, SANAS registered and within reach of the site so as not to compromise the outcome of test results due to time lapses etc.

Test results must be made available directly to the Engineer from the laboratory, who in turn distribute results to the Contractor. The Engineer may also take samples that are scheduled to be tested in terms of these procedures and submit to the designated laboratory.

The cost of sampling, transport and analysis of the samples will be for the contractor’s account. Testing must be done by a SANAS registered laboratory that has track record in the industry. If it becomes apparent that the quality of the testing procedures and results are dubious, the Contractor will be instructed to revert to an alternative laboratory, and at his own cost.

BSA.14 TRAINING OF DoH OPERATORS

The Contractor will be responsible for the supervision and training of the staff of the Department of Health on site in the following aspects:

- Effective removal of screening from of screening from screens and their collection for off-site disposal.
- Daily cleaning of grit channels and disposal of thereof by burying in designated areas.
- Removal of floatables in aeration tank and clarifier.
- Checking of aeration and clarifier operation and resolving of operational faults.
- Checking of RAS return flow and resolving of operational faults.
- Cleaning of clarifier discharge channel.
- Charging of chlorine dosing and daily monitoring.
- General training and plant procedure and safety aspects, routine maintenance, and equipment care.

BSA.14 APPLICABLE STANDARDS

The followings standards form part of the specifications:

SANS Standards:

SANS064	The preparation of steel surfaces for coating
SANS10111	Engineering Drawings.
SANS10142	Wiring of premises Part 1: Low voltage installations
SANS10313	Protection against lightning: Physical damage to structures and life hazard
SANS60947	Low-voltage switchgear and control gear
SANS156	Moulded-case circuit breakers.
SANS60269	Low-voltage fuses
SANS1091	National colour standards for paint
SANS1274	Coating applied by the powder coating process.
SANS1973-1	Low-voltage switchgear and control gear assemblies Part 1: Type-tested assemblies with stated deviations and a rated short-circuit withstand strength above 10 kA
SANS1973-3	Low-voltage switchgear and control gear assemblies Part 3: Safety of assemblies with a rated prospective short-circuit current of up to and including 10 kA
SANS60529	Degrees of protection provided by enclosures (IP Code)
SANS1507	Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1 900/3 300 V)
SABSISO 9000	Quality management systems -- Fundamentals and vocabulary
SANS1019	Standard voltages, currents, and insulation levels for electricity supply
SANS170	Fasteners

BSW WATER PURIFICATION PLANT (WPP)

BSW SCOPE

This section deals with the design, supply and commissioning of a 15 m^3/h water purification plant to replace the existing plant constructed in the 1980's. The plant must the treat raw water pumped into the existing 50m^3 ground level raw water tank. The source is the earth dam some 1,5km away from the site.

The schematic layout E765-R01 shows the configuration of the water supply system envisaged, various storage tanks and how the WPP links into the system. The boundary of the system contemplated under this Particular Specifications is schematically demarcated by the line designated as "Limit of Potable Water Treatment Plant" and al prices and rates includes for it.

BSW.1 Plant Type and General Requirements

General

The plant must be a hybrid prefabricated modular system and must be designed for a life span that exceeds **30 years.** Materials and corrosion protection must therefore be chosen accordingly. All galvanizing must comply with the requirement of a Coastal environment. Perishable materials and will not be permitted. All components and installations must be robust and sturdy.

Screwed galvanized pipework and galvanized pipes cut in away the remove the hot-dipped galvanizing is not permissible. All coupling must be welded flanges or "Klamflex" type couplings where the pipe ends are hot-dipped galvanized.

The system must be simple with as little automation as possible or must be able to be switched over to a manual mode. Indications of fault conditions, or conditions that require maintenance or intervention must be clear.

The specifications in this Particular Specification for some stages of the plant describes traditional conventional systems. The Contractor may deviate from these under the following conditions:

; that it consists of technology and components that have a verifiable, proven successful track record.
; that the Contractor made a complete submission in his tender.
; that the advantage outweighs the use of traditional configurations.
; that full details be submitted to the Engineer for approval in writing.
; risk of the design remains with the Contractor.

Should the system be of a type with elevated components that requires maintenance or operator intervention, access platforms, ladders and railing must be provided.

It must have the ability to be dissembled to be relocated to another site without the necessity to reconstruct major components elsewhere.

The plant must be able to treat up to 15 m^3/hr of raw water to the requirements of SANS 241 (2015).

The plant must be able to operate for 24 hours, or intermittently as demand requires and produce 150m^3 potable water daily.

The treated water from the plant will be discharged into a nearby 260m^3 ground level storage tank with a water level variable between 0 and 7m above the outlet of the WPP. The inlet to the tank will be at ±7m above the WPP outlet and controlled with a ø50mm “Leveldex” type level control valve.

It is expected that the water treatment plant will have the following minimum components:

- flocculation system including pH control and flocculant dosing (including supply tanks)
- Sedimentation tank(s) for the removal of solids.
- Buffer storage and filtration equipment with backwash cycle and all equipment for normal operation.
- RO filters, anti-scaling, CIP
- Chlorination equipment including dosing system and supply tanks.
- Level control of the delivery storage tank.
- Level sensing of the raw water buffer tank.
- Water meter with pulse take-off that can be linked to remote monitoring system.

Configuration

The general system configuration and operation of the plant is described in the Table below. While there is a need to control the operation of the plant automatically, the remote location, and the lack of qualified service personnel suggests that the use of a PLC-operated system may not be ideal. Therefore, a semi-automated system with some operator intervention is preferred.

Water Purification Plant configuration and requirements	
Operation	**Requirements**
Source of water	Catchment dam
Reliability of source	Reported to be good but in very dry years water must be rationed.
Pump rate	6.25 l/s non-continuous operation
Site water requirement	150 m^3/ day
Duration of operation	10 hours per day (adjustable)
Flow measurement	High solids helical in-line meter with strainer and flow gauge sight-glass in line.
Chemical treatment	Provision to be made for pH adjustment and stations for Alum and suitable poly-flocculant.
pH adjustment	Lime preferred but sodium carbonate also option. Pre-lime dosing required.
Flocculant	Supplier to test and recommend poly-electrolyte for use.
Dosing method	Solids feeder optional for lime but all dosing stations are to have duty and standby dosing sets complete with a mixed day tank and low level alarm and mixing unit.
Mixing requirements	Chemical dosage is to ensure flash mixing followed by a stilling zone to ensure complete floc build.
Sedimentation	Sedimentation to take place at a rise rate not faster than 1.35 m/h and inflow is to be equally devised between units. Two or more units preferred.
Filtration	Pressure sand filtration preferred with not less than 4 units in parallel, 800 mm sand bed of 0.9 mm diameter washed sand.
Disinfection	HTH suspension and dosing station are to have duty and standby dosing sets complete with a mixed day tank and low-level alarm and mixing unit.
Flow measurement - final	In-line helical type meter
Storage	Chlorinated potable water to discharge to ground level reservoir with high level cut-out at full level.
Sludge disposal	Sedimentation tank de-sludging to take place from under drain points through ball valve controls through pipes with minimum diameter of 75 mm. The Employer will provide a sludge discharge point maximum 5m away from the WPP with a minimum capacity of 13 lit/sec.
Backwash water disposal	Filters to be backwashed using potable water from 3 filters (no raw water flushing) and waste is to discharge to nearby discharge manhole

A schematic configuration of the system and how it is connected into the water supply system is shown on the attached schematic E765-R01. The layout also shows the elevations of reservoirs etc. that is pertinent to the design of the plant.

(Pump 1, 2 and 3 is scheduled separately in Section 7 of Schedule 1 of the Schedule of Quantities.)

BSW.2 Pipework material

If uPVC pipe fittings are to be used it will only be permitted indoors and with a minimum Class 12 pipe class. Pipework must be elevated from floor level or barricaded to discourage stepping on it.

External pipework must be galvanized fabricated or Grade 316 stainless steel or epoxy coated steel pipework. Threaded galvanized pipework will not be permitted.

Valves must be robust and durable and properly anchored to eliminate open and closing forces on pipework.

BSW.3 Design Data

The following test results of raw water from the pump station at the dam are provided for design purposes of the plant:

RAW WATER ANALYSES					
Date	**Unit**	**2006/06/06**	**2011/11/17**	**2014/07/22**	**2020/10/06**
Sample No		1	2	3	4
Type		Raw	Raw	Raw	Raw
pH		6.77	7.21	6.67	7.81
Conductivity	mS/m	21.4	34.4	24.7	45.4
Turbidity	NTU	24.6	11.7	10.9	21.1
Alkalinity	mg/l	37	54	41	
Nitrate (as N)	mg/l	<0.1	<0.01	0.17	0.53
Chloride (as Cl)	mg/l	39	51.9	21.4	83.9
Sulphate (as SO_4)	mg/l	4	6	10	10.4
Fluoride (as F)	mg/l	0.16	0.24	0.30	0.16
Sodium (as Na)	mg/l	26.4	42.3	25.7	58.1
Calcium (as Ca)	mg/l	4.3	10.4	6.3	
Calcium (as $CaCO_3$)	mg/l	11	26	-	
Magnesium (as Mg)	mg/l	4.2	6.5	4.7	
Magnesium(as $CaCO_3$)	mg/l	17	27	-	
Total Hardness	mg/l	28	53	-	
Potassium (as K)	mg/l	2.38	2.56	3.02	
Iron (as Fe)	mg/l	2.38	4.31	1.90	
Iron (as Fe) dissolved	mg/l	-	-	1.25	

Characteristics of the raw water is variable across seasons and dam levels. The proposed plant must be able to deal with these fluctuations without difficulty.

BSW.4 Connections

The following connections to the plant will be provided as measured in Schedule 2:

Inlet to WPP: ø100mm flanged pipe end. The supply pressure is determined by the level in the 50m^3 raw water tank at ground level. The estimated height of water level above plant room floor is between 0 and 3,0m.

WPP outlet: ø100mm flanged pipe end that leads into 260m^3 fire storage tank at ground level. The supply pressure is determined by the level in the raw water tank at ground level. The estimated height of water level above plant room floor is between 0 and 7,0m.

Sludge and backwash waste: Into 1x1m manhole next to plant with invert level 1,m below ground level with a capacity of 13 lit/sec.

Electrical Supply in Plant Room DB: 3 Phase 400V power supply with breaker. (Items in Schedule 4 for electrical installations.)

Sensors, sensor cabling and additional level control: To be supplied by the Contractor.

Refer to Dwg No's E765-R01 schematic layout and E765-276-005 for further clarification of the connections.

BSW.5 Sedimentation

After flocculation, the mixed raw water is to be supplied to the stilling well of the sedimentation tank and the flow directed downwards, the settling process is to take place in a zone with an upflow velocity not exceeding 1.2 m/hour and overflow of the clear water is to take place at a rate not exceeding 10 m^3/ metre of weir length. The discharge shall be free draining to a balancing tank.

Sludge disposal is to take place from the base of the sedimentation unit, and the collector shall not allow sludge to remain after subsequent discharge events.

The Contractor will only be permitted to deviate from the above basic specification upon presentation of an alternative technology that has a proven track record and clear advantages over conventional systems.

A sludge discharge pipe must be fitted to lead to the nearby discharge manhole. Sludge discharge rates should be sufficiently high to prevent sedimentation in a ø160 sewer at a gradient of 1:120.

BSW.6 Filtration of post sedimentation water

The clear water from the sedimentation tank overflow shall be supplied to a buffer tank of suitable capacity to ensure optimal filter supply runs. Clear water shall be pumped or gravitated to the filters connected in parallel. These filters shall be pressure filters complete with silica sand of suitable grading (D60 of 0.9 mm and a UC of less than 2) and shall be configured so that there is even flow of water through the filter bank to proven final water quality with a turbidity not exceeding 1.0 NTU at any filter. The filtration rate shall not exceed 7 m^3/m^2 and the backwash rate shall be less than 21 m^3/m^2. Backwashing of filters will only take place with potable quality water. If filters are to be used for back washing, then at least 4 units are required. If a pump unit is to be used, then there must be a regulator to limit flow to the required operating flow rate for backwashing. Although the above specification states that pressure filters are required the provision of a single AGF type filter (correctly sized) will also be considered.

A Rotameter must be installed on every outlet from every filter for monitoring of flow.

The filtration system must be equipped with a gauges or indicators that show the need for backwashing and rinsing. If the system is equipped with an automatic backwashing system, it must be robust and reliable, with a manual override mode.

BSW.7 Chemical dosing units

All the dosing units are to be supplied in a duty and standby configuration complete with all pipework and fittings required for normal operation. The installation shall provide for the de-coupling of any one unit for off-site repair. The dosing system shall include the delivery and suction line, the dosing unit, and the supply tank. The supply tank shall be large enough for 48 hours continuous operation and the necessary lids and agitators included.

BSW.8 Flocculation and chlorine dosing system

The contractor is required to install an Aldos 220v Single phase 0.18kW dosing pumps complete with PVC head, valves ad PTFE diaphragm (correctly sized to achieve treatment requirements) which is mechanically activated with built-in over pressure valve. The pump is to be manually adjustable between 10 - 100 % with a maximum capacity of 4 l/hr at 10 Bar and sized to operate in the middle range. The units are to be wall mounted.

A 235litre stepped polypropylene tank unit is to be installed complete with connecting pipework and valves and fitted with a tank mounted electrical axial flow type mixer (0.75 kW 240 V single phase). The shaft and impeller are to be PU rubber-coated stainless steel.

The units are to be installed complete with all fittings including DN 8 installation set (foot valve, suction line, level switch for empty indication and 10 metre delivery line with injection point).

The contractor must install a power supply from the plant room to the flocculent and chlorine dosing system and provide a local distribution box and all necessary connections for the operation of the flocculation and chlorine dosing system.

BSW.9 Sludge discharge and backwash water

Water is a scarce resource at the hospital and the system must be designed to be as frugal with water.

All pipework to the nearby waste discharge manhole is included in the prices. (10m away).

BSW.10 Provision of civil works and support structures

The cost of all pipework, ducting, cabling, supports and structures, trenching, earthworks relating to internal system components is included in the prices and rates of the WPP in Schedule 3.

BSW.11 Housing of the Plant

The Employer will provide a masonry plant room at his own cost, to be constructed under this Contract. It will accommodate Pump Sets No's 2 and 3 (Ref E765-R01). The extent of the plant room will be 5.5x12.8m and concrete ceiling height of 3.7m.

A room of 5.5x8m will be partitioned off with in which space the WPP must be accommodated. This room will be fitted with a 1829x2439 double door transformer room double with ventilators through which all equipment must be installed.

In addition to this the Employer will provide, at his own cost, a 300mm concrete plinth next to the plant room of up to 12x4m.

Should the Tenderer require additional space, he should indicate so in his tender and prices under the relevant items scheduled for the purpose of additional requirements of the WPP design.

A security fence will be erected around the plant room and plinths.

If required, the contractor must at his own cost construct and approved roof and side cladding over any components of the WPP that are sensitive to UV sunlight and weathering that will be positioned on the external concrete plinth.

BSW.12 Internal pump system

Each pump required in the WPP process must be installed in a duty/ standby configuration in a way that will allows each pump set to be removed individually without affecting the operation of the plant.

Basic pump specification:

- No Pumps to be installed, one duty and one standby, operating alternatively.
- Electrical motor: IEC3 efficiency
- Phase angle, thermal, overload and lightning protection.

Control Panel:

- Switchgear must be housed in a lockable powder coated IP55 enclosure.
- The pump must be able to be switched on and off manually to override level sensor inputs.
- Phase angle protection
- Hour metres for each pump.
- Ammeter and Voltmeter.
- Fault condition indication.
- Pumps to be switched on an alternating basis.
- Alternative pump to be switched on if fault condition on 1st pump is detected.
- All sensor cables above ground to be routed through galvanized sleeving.
- All underground sensor cables to be routed through 75mm dia PVC sleeves with long radius bends.

Pipework:

- Also refer to Refer to BSW.2
- Shut off valve on each pump inlet and outlet.
- Non-return valve to each pump outlet
- 100mm glycerine filled pressure gauges on stop cocks on inlet and outlet of pump installation.
- Flow velocity in inlet pipework should be limited to 0,8 m/s
- Flow velocity in outlet pipework not to exceed 2,6m/s

BSW.13 Commissioning

During commissioning of plants, the contractor will be required to provide staff to train and direct staff the staff of DoH. The frequency and duration is not specified, but at the end of the commissioning period, the trained staff will be required to autonomously operate the plant, including decisions making, fault finding, record keeping etc.

The tendered rates and prices for the initial testing and commissioning of the plant, including chemical analyses to determine of the quality of raw water and chemical dosage rates. Before water from the WPP is supplied to the hospital elevated tank, a chemical analysis must also be done by an independent laboratory to determine if the first production water is safe for human consumption.

The tendered rates in Schedule 1, 2 and 3 of the Schedule of Quantities must collectively include for the Operation and Maintenance of all the systems, equipment and plant installed under this contract up to the date of Practical Completion.

The tendered prices also cover the cost of operating and overseeing the operation in conjunction with the operators of the Employer during the Construction period. It is expected that the direct inputs of the Contractor will diminish over time as the proficiency of the DoH staff improves. The rest with the Contractor to carry out effective training. It is in his own interest to provide comprehensive and appropriate training to the staff in operations, fault tracing, chemical testing, adjustment of chemical dosage rates etc. He must set up effective communications channels with the DoH staff that will be responsible for the day-to-day operations of the plant.

The commissioning must also include for the setting up and keeping up to date a diary and record keeping system of operations and water quality testing.

The price also includes the supply of chemical for the 1st month of operation for a treated water production rate of 120m^3/ day.

BSW.14 Training of Operators

The Department of Health will be responsible for the supply at least 2 operators that will be permanently available to operate the plants under the oversight and guidance of the Contractor.

The contractor should note that the level of education of many of the operators relatively low and may not exceed Grade 10.

The Contractor must submit a curriculum for the training to be done and should be closely linked to the

O&M manual to be compiled for the plant. This curriculum must be submitted 30 days before training is to commence.

The Contractor will be required to commence training during the Construction Period.

The contractor must allow for the provision of his own staff during commissioning, during which time the training of the staff of the Department must be done. During the commissioning, the Contractor must progressively diminish his supervisory role in relation to the staff of the Department and all technical actions and routine decisions must be made by the staff of the Department to determine if the training has been effective.

BSW.15 Water Quality testing and Reporting

The water quality of production water must be sampled by an independent laboratory in parallel to the tests done on site and tested with the equipment purchased under this contract.

After successful commissioning, water quality testing by and independent laboratory must be done monthly and submitted with the monthly operational report.

The tendered prices must also cover all sampling, laboratory testing of at least two samples water per report.

BSW.16 Supply of Chemicals during Construction Period

An amount has been allowed for chemicals that will be required for operating the plant during the Construction Period that terminates on the date of Practical Completion. These chemicals will include the likes of pH adjustment chemicals, flocculant, anti-scaling agents for RO systems and disinfection agents like chlorine.

The Contractor must obtain at least 3 independent quotations for the procurement of chemicals that includes the cost of delivery to site. The Engineer may also obtain independent quotations.

After the plant has been successfully commissioned, the Contractor must submit to the Engineer the results of the water tests and tests for determining dosage rates of the various chemicals. The Contractor will then be instructed to order the required chemicals on a scheduled basis that takes into account average water consumption rates, dosage rates and space for safe storage etc.

Any excessive and unexplained use of chemicals that indicates to theft or wastage, over and above the estimated dosage will for the cost of the Contractor.

Storage of the chemicals will be the responsibility of the Contractor during the Construction Period and the O&M period and he must provide the safe storage space for it.

Measurement and payment
The tendered mark-up covers all overheads, costs, profit, and safe storage on site.

BSW.17 Supply of equipment and protective clothing

It is required that the contractor supply basic equipment for the routine cleaning and day to day operation of the plants. This basic equipment shall be supplied by the contractor to the works and assigned to specific personnel. Records of the supply shall be maintained for the duration of the contract. Each worker not employed by the Contractor shall be issued with the following equipment in an annual cycle:

- two (2) full piece overalls
- two (2) sets of rubber elbow length gloves
- one (1) pair black gum boots
- one (1) pair safety work boots.
- Safety glasses and ear mufflers

All activity specific safety equipment like protective eyewear and ear mufflers shall be supplied by the contractor and the cost of supply shall be deemed to be included in the rates tendered.

In addition to the above the works shall be supplied with the following equipment for the proper operation and maintenance of the works:

- sampling bucket
- cleaning rakes for screening works
- spades and shovels for grit removal and general cleaning
- net and extension pole for floatable material collection
- dust bins for waste collection on the site
- 2 No Stihl FS250 bush cutters with two sets of protective gear (ear-, leg- and face protection).

All consumable materials shall be supplied by the contractor and the cost of supply shall be deemed to be included in the rates tendered.

BSW.18 Supply of equipment and protective clothing

As part of the equipment supply, the Contractor shall supply the following testing equipment and train the DoH operators in the use of the equipment:

1) Turbidity meter, to be manufactured by either Hach, Hanna or Orbico-Hellige, and shall read in the range 0.1 to 100 NTU, supplied complete with standardisation kit, measuring cells and instruction books. The Turbidity meter shall be able to operate at 240 Volts.

2) Residual Chlorine Meter, to be manufactured by either Hach, Hanna or Merck, and shall read in the range 0 to 5mg/litre in 0.1mg increments supplied complete with standardisation kit, measuring cells and instruction books. Sufficient free/residual chlorine test kits to be supplied to test 500 samples. The Chlorine Residual Tester shall be of the Colorimeter type and be able to operate at 240 Volts.

3) Benchtop pH meter to be non-wettable, of robust construction with automatic calibration at pH4, pH7 and pH9, and with an accuracy of 0.1 pH unit. The pH meter shall be supplied with one litre each of buffer solution (pH4, 7 and 9), spare electrode, and electrode holder supplied complete with standardisation kit, measuring cells and instruction books. The pH meter shall be able to operate at 240 Volts.

4) Magnetic stirrer, to be of robust design with no metal surface exposed. Capacity 500ml glass

beaker with variable speed (non-digital) and to operate at 240 Volts. The magnetic stirrer shall be supplied with three stirrer bars of 25mm length and with white epoxy coating.

5) Selection of plastic Labware including 250, 500 ml beakers and 100 and 250 ml measuring cylinders (5 each).

BSW.19 Inclusivity of prices

The collective scheduled rates for the WPP must cover the complete design, installation, testing, monthly reporting, commissioning, training of operators, oversight, operation and maintenance of the plant. It also covers all repairs, replacement like filters, globes, drive belts, lubricants, and service parts.

Measurement and payment
The tendered prices and rates collectively will be deemed to include for the above, regardless of the timespan between commissioning and Practical Completion.

BSB: OPERATION AND MAINTENANCE

SCOPE

New STW and WPP

The Contractor is to operate and maintain the new Sewage Treatment Plant (STW) and the new Water Purification Plant (WPP) for the duration of the O&M period.

The Contractor must also provide on-site training of staff provided by Department of Health (DoH). This training must commence within the Construction Period and prior and during the commissioning period. Refresher training must be done during the O&M period.

Existing Raw Water Pump Station

It also covers operation of the existing pumping station, which is located some 1,5km away at the water supply dam of the hospital. The “as-built” layout of the pump station is included under the drawings. Please note that the pump station may still be within the Defects Liability which started on 31 March 2021 and ends on 31 March 2022. Please note that the Contractor will not be required to carry out any repairs at this pump station. His functions will be limited to operate the pump station to ensure supply of water to the hospital and vegetation control within the fenced confines of the pumping station.

Pumping Installations by Others

The following pump installations are included in the scope of the Operations and Maintenance:

- Duty/ standby submersible 0,7kW recirculation pump set with level control gear (Pump 1 on Dwg E765/005 (Pump Model: Grundfos Unilift AP12.40.04.A1)

- Fire booster pump set with one 42kW electrical main pump, diesel standby pumps and jockey pump with switchgear (Model: Grundfos EN-S2 80-200 JS-ASD-U1 fire pump set with and Grundfos CM3-8 A-R-A-E-AVBE F-A-A-N jockey pump.). (Pump 3 on Dwg No E765/005). This includes the annual testing of the system by a company registered in terms of legislation every 12 months.

- Duty/ standby domestic supply pump into elevated tank with level controls and switchgear. (Pump type: Grundfos NK32-125 A2-F-K-E-BAQE to ISO 2858.) (Pump No 2 on Dwg No E765/005)

For the purposes of the Contract, the Operation and Maintenance (O&M) Period is the period during which the Contractor is responsible for the operation and maintenance of the Sewage Treatment Plant, Water Purification Plant, and all infrastructure and facilities installed under this Contract within the hospital premises. The O&M period starts on the day of Practical Completion and the duration is stated in the Contract Data.

The Employer has the right to decrease this period by giving 3 months written notice. The Contractor must then use this time to bring all outstanding scheduled services and parts replacement up to date.

The tendered rates in Schedule 1, 2 and 3 of the Schedule of Quantities must collectively include for the Operation and Maintenance of all the systems, equipment and plant installed under this contract.

Please note that the rates must be balanced between cost relating work to installations and O&M. The Engineer will adjust the rates if he is of the opinion that they are imbalanced or front loaded. The

Contractor will be required to submit cost calculations to justify his rates.

BSB.1 General Principles of Payment for Operation and Maintenance

The Preliminary & General items for Fixed Cost charges and Time Related charges as defined in SABS 1200 is scheduled in Schedule 1: Section 1 Preliminary & General. The relevant scheduled items, although not listed separately covers all costs and charges related to fixed and time related charge.

The items scheduled for commissioning and training are found in Sections 1 and 2 of Schedule 2.

The supply of chemicals is scheduled separately as a Provisional Sum.

Control of the regrowth around the sewage treatment plants and around the pump station at the dam during the Construction Period and the O&M period is scheduled in Schedule 1 as a SMME package. The Contractor will however be responsible to oversee and co-ordinate his work.

BSB.2 General requirements

The activities required of the Contractor will include at least the following:

- Routine inspection and sampling.
- Collection of samples and analysis by a control laboratory during the commissioning period and O&M period.
- Maintaining of the site diary and record keeping system.
- Monthly submission of reports on the operation and performance of the plant.
- Scheduled and routine servicing and maintenance of units
- Provision of spares, chemicals, and consumables for the optimal operation of the plant.
- Ongoing refresher training of DoH.
- Reporting of information in compliance with regulations, industry standards and directives of Department of Water and Sanitation.
- Repair and/ or replacement of any items deemed non-functional and out of warranty.
- General repairs to buildings and sanitary wares in plant facilities, like broken handles, replacement of globes etc.
- Final servicing of installations before termination of the O&M period.
- Close out report at termination of O&M period.

The following is excluded from the responsibilities of the Contractor:

- Painting of buildings.
- Repairs of the pump station at the dam.

It is not a requirement that the Contractor be represented on site on a full-time basis. He must visit the site at least fortnightly and spend sufficient time to review processes, plant, and the performance of the DoH staff and carry out ongoing and refresher training.

When the staff of the Department has proved to be capable to operate the plant independently, the contractor may diminish his presence on site to the extent to carry out service visits, sampling, and supplementary training of the staff of the Department. The risk related to of the level of supervision that the Contractor provides is his own. It is therefore in the interest of the contractor to ensure that training is effective and comprehensive. The contractor must however visit the site at least fortnightly or when

a breakage has been reported that needs his attention.

BSB.3 Payment and retention moneys

Retention monies applicable to the Operation and Maintenance period is stated in the Contract Data.

The Employer is under no obligation to pay if plants are not operated to achieve the required standards of effluent or potable water, or level of upkeep and maintenance. If water supply or treatment of effluent is interrupted due to the failure on the part of the Contractor, payment reduction will be applicable om-a pro-rata basis.

Should the Contractor fail to comply with his responsibilities and functions, the Employer may exercise his rights to appoint others to carry out the work. The notice periods stated in the General Conditions of Contract to the Contractor will not apply under emergency situations.

Additional payment for non-routine work will only be made when such work has been approved in advance and in writing.

BSB.4 General duties of the Contractor: Sewage Treatment Works

The responsibilities of the Contractor during the O&M period will include the training and parallel management of plant with the staff of Department of Health staff assigned to the works. This includes the following:

Routine maintenance of mechanical and electrical equipment. These duties shall include:

(Items in Italic letter below is not within the responsibility sphere of the DoH staff and is to be carried out be qualified staff of the Contractor.)

- Checking all electrical and mechanical equipment for sound operation.
- Checking and adjusting operational settings.
- Checking and adjustment of valve operations.
- Checking and adjusting of all pump systems.
- *Adjusting and maintenance of timer-controlled operations.*
- *Routine lubrication and servicing of all motors and pumps as required by operations manual.*
- Fitting of spares and replacement parts as required.
- *Replacement of fan belts and filters*
- *Changing of gearbox oils.*
- *Services of bearings.*
- External application or topping up of lubrication where required.

Plant performance is to be monitored by the Contractor and status is to be reported to the Engineer. The following duties are to be included in the scope of work:

- Assessment of sludge volume in aerator (daily).
- Assessment of sludge volume in RAS system (daily).
- Operation of chlorine dosage system.
- Check cleanliness of screens and grit channel discharge.
- Discharge of surplus activated sludge.

- Discharging of sludge into sludge lagoon by setting valves and sluices.
- Check on sludge lagoon levels and alter where necessary.
- Set weirs in distribution box to facilitate sludge wastage.
- Check clarifier operation.
- Check and set chlorine dosage rates and supply adequate stocks of HTH.
- Check cleanliness of clarifier and discharge channels.
- Record hour meter readings and flow meter readings at works (Report readings to Engineer on a fortnightly basis)

Sampling and submission of monthly reports and records are to be made to the Engineer. The following are required:

- *Collection of inflow, and final effluent samples on each visit.*
- *Collection of reactor and RAS samples on every visit.*
- *The provision of flow and hour meter readings on each visit.*
- *Submission of status and fault reports.*
- *Deployment and collection of Cholera swabs (as required).*

BSB.5 General duties of the Contractor: Water Purification Plant

The Contractor must operate and maintain the plant during the O&M period. In addition, the Contractor will be required to monitor the processes, make process adjustments, and carry out or supervise all the operational tasks required for the works to comply with the specified potable water quality. These activities will include but is not limited to the following:

(Items in Italic letter below is not within the responsibility sphere of the DoH staff and is to be carried out be qualified staff of the Contractor.)

- Routine inspection and sampling of the raw water supply, potable water supply and process.
- Collection and recording water meter readings.
- Collection and testing of samples of both raw water and production potable water.
- *Submission of quarterly reports on the operation and performance of the plant*
- *Routine servicing of units*
- *Routine maintenance of units*
- Backwashing and rinsing of filters.
- Cleaning and replacement of filter media
- Provision of spares and consumables for the optimal operation of the plant
- Supply of protective equipment for operators and the repeat training in the use of safety equipment
- Maintenance of the surrounds of the works, including mowing of lawns in the fenced enclosure around the plant (30x30m).
- Repair and or replacement of any items deemed non-functional and out of warranty.

The designer of plant will compile an Operation and Maintenance schedule and submit it to the Engineer for approval. The maintenance schedules of manufacturers of components of the plant also form part of the maintenance schedule and is deemed to be included in pricing.

BSB.6 General duties of the Contractor: Installations by others, buildings at WPP & STW

a) The maintenance of following the pumping equipment described under “Scope” and designated

as Pump 1, Pump 2, and Pump 3.

b) All new interconnecting pipework, valves and special fittings as shown on Dwg No E765/005.
c) 140m of new high security (Clearvu) fencing around WPP and plant room
d) New 280m^3 prefabricates steel tank at ground level, including control valves.
e) New 12.8 x 5.5 x 3.7m high new plantroom with concrete roof.
f) New 4.0 x 5,0m blower room and nearby small toilet block.
g) Refurbished 4,0 x 4,0m filter building that will be used as storeroom and office.
h) New 1.8x2.5 m chlorination hut with concrete roof and steel gate.
i) Existing underground brick reservoir with fibre-cement roof (including painting).
j) All siteworks around WPP and Plant room inside the fenced area.
k) The scope of maintenance entails general housekeeping, proper cleaning and washing down once every 2months, annual painting of painted surfaces of deteriorated and the final painting just before expiry of the 24month O&M period.
l) Mowing of grass inside the fenced areas and within 5m of any structure or building of the WPP and STW.
m) Removal of weeds and grass in paving and walkways and general vicinity of buildings and around plant components, e.g. STW reactor, chlorine building, STW buildings, channels and parking area.
n) Repair of plumbing and sanitary fittings, broken windows, door latches, hinges etc.
o) Servicing of fire extinguishers.

The above will be inspected and approved by the Engineer before expiry of the O&M period if in good order. The Contractor must submit all certificates and documentation that scheduled maintenance of fire, mechanical and electrical installations have been done.

BSB.6 Remuneration and Authority of DoH Employees

The Department of Health shall be responsible for all costs of employment of operators and shall have authority over the employee's in so far as disciplinary action and censure. The contractor shall only cost for the indirect (delegated) management of these personnel.

BSB.8 Supply of Chemicals

The supply of chemicals will follow the stipulations of BSW.16

BSC: BUILDING RENOVATIONS

BSC.1 REPAIRS UNPAINTED TO PLASTER

The unpainted plaster of the ablution, blower room and chlorine hut are cracked and delaminating. The plaster must be assessed and marked by the Contractor, after which the Engineer will give written instruction of which portions of plaster must be removed and redone.

The tendered rates for the repairs to plaster works must include for bonding liquid, plaster key, reinforced crack fillers like abe dura rep or similar and skim coats or other repair agents to repair the existing plaster to walls, ready for priming and application of a undercoats.

It must also include for all labour, scaffolding, sanding down, consumables, paint etc. to complete the work,

All work must be in accordance with the methods and recommendations of the manufacturer of the products that the Engineer has approved to be used. The Contractor must submit the details of the product and method statements that he proposes to use prior to the commencement of work.

BSC.2 PAINTING OF EXISTING METAL DOORS AND WINDOW FRAMES

The rusty mild steel window frames and doors must be sand blasted ins-situ to ISO-Sa2½ and coated with a zinc rich two-part epoxy primer like and Amercoat 68 HS or similar with a suitable epoxy final coat.

The details of paint system to be used must be submitted to the Engineer for approval, prior to the commencement of the work.

The relevant tenderered rates collectively include for everything necessary to complete the work, including all preparation, primers, final overcoats, masking off, labour etc.

BSF FENCING

BSF.1 SECURITY FENCING

The security fencing is to be “Betafence Securifor 3D 25” with 2000mm nominal height, post at 2500mm spacing and aperture of 76x25mm, installed according to the instructions and specifications of the manufacturer. The fencing must comply with the following minimum specifications:

WELDED PANELS

- Heavy welded security mesh with **SECURIFOR 3D 25** -type fine mesh.
- The strength and stiffness of the panels are reinforced using horizontal reinforcement folds, referred to as V-forms. Tensile strength of the horizontal and vertical wires: Min. 400 N/mm²
- The minimum average welding strength is 50% of the total tensile strength of the wire in accordance with EN 10223-7.
- Wire diameter: 4.00 mm Mesh size: 25 x 76.2 mm Panel width: 2518.6mm
- Panel height: 2000mm

PANEL COATING

- Made of galvanized wire and plastic coated with polyester - min. a layer thickness of 150 microns. The polyester coating thickness is the average of 10 measurements.
- At the coast or in corrosive environments, Zincalu Super panels and a higher polyester coating thickness are recommended. (always in consultation between buyer and seller).
- Standard color RAL 6005.

The complete configuration consists of corrosion-resistant parts that meet 1000 hours of salt spray testing:

- After 1000 h exposure to salt spray in accordance with ISO 9227, there will be no adhesion loss of more than 10 mm at the place where a cut is made in the polyester coating.
- Colorfastness in accordance with ISO 16474-3:
- The color difference after 1000h QUV-A expressed in ΔE is maximum 3. Gloss difference after 1000h QUV-A is a maximum 50% of the original.

ACCESS0RIES

- U-profile galvanized and plastic-coated; to reinforce the upper edge of the panels. Dimensions 35 x 13 x 2420mm + corresponding attachment set M6x25 in stainless steel A2 + pinion and hexagonal nut in stainless steel A2.
- U-profile with a toothcomb galvanized and plastic-coated; to reinforce the upper edge of the panels. Dimensions 35 x 13 x 2420mm + corresponding attachment set M6x25 in stainless steel A2 + pinion and hexagonal nut in stainless steel A2.
- "L" profile 80 x 40 x 4 mm to connect the underside of the panel with the concrete beam, galvanized and plastic-coated + corresponding attachment set.
- "H" profile to connect the underside of the panel with the concrete slab, galvanized and plastic-coated + corresponding attachment set.

STANDARDS

- -ISO 16120-2: Non-alloy steel wire rod for conversion to the wire - Part 2: Specific requirements for general-purpose wire rod.
- EN 1179: Zinc and zinc alloys - Primary zinc.
- ISO 22034-2: Steel wire and wire products - Part 2: Tolerances on wire dimensions.

- EN 10223-7: Steel wire and wire products for fencing and netting - Part 7: Steel wire welded panels for fencing.
- ISO 9227: Corrosion tests in artificial atmospheres - salt spray tests.
- ISO 16474-3: Paints and varnishes - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps.

POSTS

Post are to be Bekafix, 2575mm long and suitable for concreting into bases.

INSTALLATION IN CONCRETE

The posts are positioned in a mixture of a low slump 20MPa concrete every 2520 mm (+/-2 mm) from centre post to centre post. The concrete footing has an augured diameter of 25cm and must be placed at least 50 cm below ground level. Installation is carried out according to the installation manual of the manufacturer.

The fence is built according to the post-panel-post principle.

At the start, one panel is fastened on each side to the intermediate posts using polyamide or metal clamps, as follows:

- At least one polyamide or metal clamp per post to be placed where the horizontal and vertical wires cross; the other clamps just below or above a horizontal wire.
- To prevent sabotage an A2-grade stainless steel fastener set (consisting of A2-grade stainless steel lock bolt + self-breaking nut) can be placed straight through the clamps and the post, ensuring that they cannot be disassembled.
- The corner posts are placed on the line with the bisector of the right or obtuse angle to be made. The panels are fastened to the corner post using only a plastic-coated metal clamp.
- For an acute angle, the post with the panel making the acute angle is concreted into the same pit as the last line post

SPECIFIC APPLICATIONS

- Reversible panel (spikes are to be to the bottom of the fence)
- For sloping terrain, height differences can be achieved of at least 2.5 cm
- Fitting pieces are cut on-site and should then be retouched professionally – in accordance with methods approved by the Engineer.

FIXTURES

The fencing arrangement must be configured to suit sensing and alarm systems as specified by the Engineer.

WARRANTY

The manufacturer must provide a 10year warranty certificate in a non-corrosive environment (Class C1-2-3).

DEALING WITH SLOPES

The contractor is to eliminate height differences by excavating to a depth of 75mm and reshaping the soil to suit. The maximum permissible gap under the fence is 50mm. If this is exceeded, the panels must be cut and additional posts installed.

Measurement and payment

Grubbing, clearing, base excavations and concrete is measured as separate items and is covered by

the stipulations of SABS 1200 C, D and G respectively.

The fencing length is measured in plan, regardless of gradient. The rate includes for the complete fence, installed with all fixing devices, bolts, nuts etc, with Bekafix posts every 2500mm.

Additional posts:
Additional post required for inflections, corners and to deal with steep slopes are scheduled separately to cover the post over and above the nominal spacing of 2500mm c/c.

Cutting of Fencing Panels:
These scheduled items cover the cost of cutting and making good of fencing on site to match setting out co-ordinates and to adapt panel lengths to deal with steep slopes.

(The previous two items do not cover any additional items brought about by the program, planning and execution method of the contractor.)

The tendered rates collectively include for the full installation of the fencing, including the minor shaping of the soil surface to accommodate sloping terrain as described above.

BSG: CCTV INSPECTION OF SEWER INFRASTRUCTURE

BSG.1 SCOPE

This specification covers the inspection of approximately 3.1km of sewers, installed around the hospital complex during 2016.

It is required the bores, vertical and horizontal alignment of these existing sewers with nominal diameters between 100mm and 160mm be inspected with colour closed-circuit television (CCTV) camera equipment. The inspection must be recorded on video and still photo in digital format.

A layout drawing of the sewers accompanies this document for reference purposes. The layout is also available in *.dwg format on request. table in a *.xcel file. The positions of manholes and sewers may be an approximation and must be verified on site.

Large trees on site are sparse and root ingress of large trees are not expected.

The Contractor will be required to carry out the following tasks:

- Compliance with OHS Regulations, including submission of all necessary files to the Main Contractor.
- Establish necessary personnel and equipment on site.
- Locate and open sewer manholes.
- Establish equipment for heavy cleaning.
- Making safe for access into sewers, setting up of survey equipment.
- Internal CCTV inspection, recording of data and logging of defects.
- Submission of data and report.

BSG.2 Quality

Before the subcontractor commences with the survey, he must submit an example video of previous sewer inspection work that shows operational and structural defects in sewers, complete with inspection log for evaluation. Any modifications of procedure and equipment will then be determined to ensure that the outcome of the survey complies with the specification.

BSG.3 Inspection Logs

Unless otherwise indicated, submit inspection logs that include the following as a minimum:

- Date recorded (.mp4 and .jpeg)
- Sewer Identification that corresponds with the “as-built” layout.
- Pipe segment length
- Pipe material and diameter
- Direction of camera's travel
- Vertical orientation reference.
- Counter reading (distance index) at beginning and end of each manhole-to-manhole pipe segment.
- Comments, positions, and type of defect detected.

The Contractor must maintain a copy of all inspection documentation (recordings, databases, and logs) for the duration of work and until the completed inspection data and report has been signed off.

Video File Specification

- All video to be recorded digitally (analogue to video transcoding is unacceptable).
- All video files should be delivered in .mp4 (preferred) format (other formats may be acceptable but must have prior approval).
- All videos should be 32-bit colour.
- Videos must be clear and in focus.
- Aspect ratio of 4 x 3.
- Minimum image resolution to be 2 Megapixel (1600 x 1200) or better.
- A preferred frame rate of 30fps, minimum frame rate of 24 fps.
- Sufficient bitrate must be used so that artifacts are not visible or audible.
- Video files must be delivered in the native aspect ratio of the camera i.e. anamorphic (distorted projection or perspective) video is unacceptable.

All video files must be uniquely named and as follows:

Tafalofefe{Start MH ID} – {End MH ID}. mp4

Example: Tafalofefe145-156.mp4

If the inspection traverse between two manholes was interrupted due to a physical defect or other obstruction that cannot be removed by cleaning, separate video files must be created and numbered as follows:

Tafalofefe145-156-1.mp4 and Tafalofefe156-145-2.mp4

The above indicates that more than one file exists for the same pipe and the change of travel direction during the survey.

Image File Specification

- Image files must be delivered in .jpeg format.
- 2.0 Megapixel (1600 x 1200) resolution minimum.
- Minimum horizontal and vertical resolutions of 96 dpi.
- Images must be clear and in focus.

All image files must be named by the Facility ID of the pipe segment surveyed. Where there are multiple images for a pipe segment, the images should be suffixed by an underscore and an incremental index number, e.g.:

Tafalofefe{Start MH ID} – {End MH ID}-{XXX}-{YYY}.jpeg

- Where YYY is a sequential number if more than one image exists with the same distance index.
- Where XXX is the distance index in meters to the nearest 0,1m.

Example: Tafalofefe145-156-99.4-001.jpeg and Tafalofefe145-156-99.4-002.jpeg etc

BSG.4 Reports

All reports must be delivered in .pdf format.

Please note that any deviation from the specification in this paragraph “Digital File Format” must be approved before any work is carried out.

BSG.5 Camera Specification

The following are minimum camera equipment standards that must be met:

- Equipped with rotating head, capable of 270-degree rotation from horizontal and 360degree rotation about its centre line.
- Camera Lens: Not less than 140 degree viewing angle, with automatic or remote focus and iris controls. Hemispherical Fisheye lenses not permitted
- Focus and Iris Adjustment: Focus to be adjustable through range of 152 mm to infinity. The area in focus in front of the camera must be from 150mm to twice the bore of the pipe.
- Camera(s) shall be intrinsically safe and operative in 100 percent humidity conditions.
- Lighting Intensity: Remote-controlled and adjusted to minimize reflective glare.
- Lighting and Camera Quality to provide clear, in-focus picture of entire inside periphery of sewer.

BSG.6 Data Recording

The following information must be recorded on the first 20 seconds of a video of a run. The following is the minimum information that must be included as a text overlay:

- Entry Manhole and Downstream manhole ID and direction of travel
- Date of format YYYYMMDD
- Pipe size and material

BSG.7 Distance Measuring

- All distance measurements must be metric system.
- Distance measurement must be accurate to within 0.5% of the above ground measurement.
- Distance counter must be able to read a minimum distance of 0.10m and be reset remotely.
- The counter must be reset at face of the manhole at the entry point into the bore of the of the manhole.
- The distance counter reading must be recorded on the video image or the still image.

BSG.8 Procedure

The following procedural requirements must be met:

- Sewers must first be pre-cleaned and conditioned by rodding with wire brush and/or flushing to remove any obstructions, cobwebs, growth and other obstructions that may prevent entry of the camera and the obstruct the view of the lens.
- The camera lens must be kept clean during the survey.
- Traveling speed of the camera in the pipeline to be as follows:
  - 0.1m/s for pipeline of diameter less than 200 mm.

- 0.15 m/s for diameters exceeding 200 mm but not exceeding 310 mm
- 0.20 m/s for diameters exceeding 310 mm.

- Provide 360-degree sweep of pipe interior at points of interest, to fully document existing condition of sewer.
- Points of interest may include, but are not limited to the following: defects, encrustation, mineral deposits, debris, root ingress, sediment, intersections of erf connections, collapse and any location determined not to be clean.
- The cabling system employed to transport camera and transmit its signal shall not obstruct camera's view.
- The inspection must be sufficiently logged and recorded in order that the positions of defects can be located for the purposes of repairs.
- Flow must be controlled to limit the flow depth to 20% of the internal bore during inspection.

BSG.9 Cleaning of Sewers

Reasons for cleaning are as follows:

a. Normal sewer cleaning is defined as removal of minor quantities of silt and debris preventing observation of sewer condition and defects. This type of cleaning can be done with hand operated brushes and plugs and rinsing by flushing with water. This cleaning is deemed to be included in the per metre rate for CCTV inspection of sewers under the Items scheduled.

b. Heavy sewer cleaning is defined as removal and extraction of silt, debris, and obstructions from the sewer which prevent entry and use of CCTV equipment, or the completion of the sewer run and/or manned-entry inspection of sewers. Normally water jetting will be adequate to blow out and dislodge this kind of blockages and obstructions.

   This type of cleaning will be paid for the total distance from entry manhole to exit manhole, regardless of the length of the affected sewer.

c. Mechanical cleaning is defined as the removal of hard or semi-hard deposits, tuberculation, or other materials requiring the use of mechanically operated equipment which prevent entry and use of CCTV equipment, or the completion of the sewer run and/or manned-entry inspection of sewers. It is not anticipated that this type of cleaning will be used under the scope of this specification.

Debris and silt must be removed from the nearest downstream manhole and not allowed to run further down the sewer system.

BSG.10 As-Builts

Copies of the “as-built” sewer layout in A0 hardcopy format will be provided to the Contractor. The Contractor must hand amend the sewer layout where deviations exist. Enough dimensions and reference information from known points like erf corners and boundaries must be given to the Engineer to enable him to correct the “as-built” layout to a reasonable level of accuracy. Sewer diameters, pipe material and manhole depths must also be recorded on the drawings if found to be incorrect.

BSG.11 Measurement and Payment

The following applies to the Items in the Schedule of Quantities:

a) General Items

This item covers:

- Preliminary and General Items
- Site establishment and removal
- All fixed cost for compliance with OHS Regulations.
- Staff and supervision
- Transport and equipment

The rate for this item will be paid when all equipment has been established and the sample inspection data and format has been accepted by the Engineer. The amount is limited to a maximum of 30% of the total inspection cost.

b) CCTV Sewer Survey

Rates for this Item will be payable upon the submission and acceptance of the inspection logs and is measured per linear meter measured from the centre line of manholes.

The amount is fully inclusive of locating and opening of manholes, access, pre-cleaning and conditioning by brushes or other means, setup, internal inspection and recording of data and logs.

c) Cleaning of sewers

This item is only applicable after written consent by the Engineer for each section of sewer that requires Heavy Cleaning by jetting or augers. The items allowed for cleaning collectively include for establishment, setup and cleaning as described in previous paragraphs.

BSH: REPAIRS TO INTERNAL PLUMBING AND SANITORY WARE

BSH SCOPE

The Contractor will be required to carry out repairs to existing sanitary wares and plumbing in the hospital.

An assessment must be carried out prior to the commencement of the repairs. This must be done by a Qualified Plumber of the Contractor, in consultation with the Hospital Management and the Engineer to determine the scope of repairs.

The repair required and to be agreed upon must be recorded on a schedule on a per room basis, prior to the commencing of work. A reasonable time span must also be agreed with the Engineer.

It must be noted that work will be done within a functioning hospital environment.

A Qualified Plumber is a person that applied for this category of registration has passed the relevant plumber trade test as specified in the Manpower training act section 28 or 13 and/or have obtained a plumber qualification in terms of the Skills Development Act.

Plumber's Hand (Level 2) is a person that has applied for this category of registration must have passed the relevant trade test as specified in the Manpower Training Act Section 28 or be Recognised for Prior Learning in terms of the Skills Development Act. It must be noted that this is not a full plumber's qualification and this person allied for this category of registration still must work under the adequate supervision of a Registered or Licensed Plumber.

BSH.1 Plumbing Team

The Contractors must assign a team consisting of a Qualified Plumber, a Plumbers Hands (Level 2), and two general workers of Grade 1 and 2 on a full-time basis to administer and carry out the work.

Measurement and payment

The contractor will be remunerated per 5day work week during which productive work is done by the team consisting of the Qualified plumber, Plumber's Hand Level 2 and 2 workers.

The rates cover Preliminary and General Items, transport, equipment, overheads, markups and profits on personnel and workers. The Contractor must obtain prior approval from the Engineer for any additional workers to be added to the team to be remunerated at daywork rates or otherwise.

The cost of the assessment is deemed to be included in the Preliminary and General Items of the Contractor.

BSH.2 Materials

The contractor must obtain at least two quotations for all materials and

BSL: EXPANDED PUBLIC WORKS PROGRAMME: LABOUR INTENSIVE CONSTRUCTION

These specifications must be read together with the latest revision of the Guidelines for the Implementation of Labour Intensive Projects under the Expanded Public Works Programme (EPWP).

BSL1 SCOPE

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

a) trenches having a depth of less than 1.5 metres
b) stormwater drainage
c) low-volume roads and sidewalks

all activities marked LI in the schedule of quantities.

BSL2 PRECEDENCE

Where this specification is in conflict with any other standard or specification referred to in the Scope of Works to this Contract, the requirements of this specification shall prevail.

BSL3 HAND EXCAVATEABLE MATERIAL

Hand excavatable material is material:

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

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

Note:

1. A boulder, a cobble and gravel is material with a particle size greater than 200mm, between 60 and 200mm.
2. A dynamic cone penetrometer is an instrument used to measure the insitu shear resistance of a soil comprising a drop weight of approximately 10 kg which falls through a height of 400mm and drives a cone having a maximum diameter of 20mm (cone angle of 60° with respect to the horizontal) into the material being

Table 1: Consistency of materials when profiled

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

BSL4 TRENCH EXCAVATION

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

BSL5 COMPACTION OF BAKFILLING TO TRENCHES (AREAS NOT SUBJECT TO TRAFFIC)

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

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

BSL6 EXCAVATION

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

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

BSL7 CLEARING AND GRUBBING

Grass and small bushes shall be cleared by hand.

BSL8 SHAPING

All shaping shall be undertaken by hand.

BSL9 LOADING

All loading shall be done by hand, regardless of the method of haulage.

BSL10 HAUL

Excavation material shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150 m.

BSL11 OFFLOADING

All material, however transported, is to be off- loaded by hand, unless tipper-trucks are utilised for haulage

BSL12 SPREADING

All material shall be spread by hand.

BSL13 COMPACTION

Small areas may be compacted by hand provided that the specified compaction is achieved.

BSL14 GRASSING

All grassing shall be undertaking by sprigging, sodding, or seeding by hand.

BSL15 STONE PITCHING AND RUBBLE CONCRETE MASONRY

All stone required for stone pitching and rubble concrete masonry, whether grouted or dry, must to be collected, loaded, off loaded and placed by hand.

Sand and stone shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150m.

Grout shall be mixed and placed by hand.

BSL16 MANUFACTURED ELEMENTS

Elements manufactured or designed by the Contractor, such as manhole rings and cover slabs, precast concrete planks and pipes, masonry units and edge beams shall not individually, have a mass of more than 320kg. In addition, the items shall be large enough so that four workers can conveniently and simultaneously acquire a proper hand hold on them.

BSL17 BREAKING UP OF REINFORCED CONCRETE

Breaking up of reinforced concrete is regarded as labour intensive but may be done with the aid of mechanical of pneumatic breakers. Loading and offloading of rubble must however be done manually.

PORTION 3
SPECIALIST WORKS

ELECTRONIC SURVEILLANCE SPECIFICATION

TAFALOFEFE HOSPITAL – WATER AND WASTE WATER TREATMENT WORKS

SCMU5-24/25-0037

Portion 3.1: Electronic Surveillance Specification (**This document**)
Portion 3.2: Electrical Specification
Portion 3.3: Indoor Generator Set Specification

THE SUPPLY, INSTALLATION AND COMMISSIONING OF AN IP BASED CLOSED CIRCUIT TELEVISION SURVEILLANCE SYSTEM

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COMPLIANCE WITH REGULATIONS

(a) The installation shall be erected and tested in accordance with the latest issues and amendments of the following Acts and regulations:

(i) SANS 10142: "Code of Practice for the Wiring of Premises",

(ii) SANS 2220 – 2 Section 1 – 7 of 2014,

(iii) The latest issue of SANS 60794: “Optic fibre”,

(iv) Security Industry Regulation Act, 2001,

(v) the Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,

(vi) the Local Government Act 1998 (Act 10 of 1998 (Gauteng), municipal by-laws and any special requirements of the local supply authority,

(vii) the National Building Regulations and Building Standards Act 1996 (Act 29 of 1996),

(viii) The Post Office Act 1958 (Act 44 of 1958) as amended,

(ix) the Electricity Act 1996 (Act 88 of 1996) and

(x) the Regulations of the local Gas Board where applicable.

E3.1. PROJECT SPECIFICATION

E3.1.1 INTENT OF DOCUMENT

The specification is intended to cover the complete installation of the CCTV Video Surveillance System to be installed at the Tafalofefe Hospital, Centane. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the contractor.

In all cases where a device or part of the equipment is referred to in the singular, it is intended that such reference shall apply to as many devices as are required to complete the installation.

E3.1.2 GENERAL

This specification covers the supply, installation, commissioning and guarantee for twelve months of the CCTV system capable of stand-alone operation including monitoring, video surveillance, remote access and sufficient footage archiving.

The drawings issued herewith and listed in the relevant section are to be read in conjunction with the specification and all items mentioned, together with all ancillary equipment necessary for the correct installation, operation and full compliance with the Standards and codes must be provided, notwithstanding the fact that they may not have been included in detail in these documents.

The Tenderer shall, at the time of tendering, draw the Engineer's attention to any omissions or discrepancy between the specification and the drawings and request from him clarification of details or responsibilities.

If a limited allowance or special conditions are made for the Tender Sum for the supply or erection of any item of the installation, the limit or special conditions shall be defined at the time of tendering.

It is the sole responsibility of the Contractor to ensure that all quotations obtained from manufactures and suppliers are complete in their entirety and must include all equipment and accessories necessary for compliance with current practice and the efficient and proper functioning of the installation.

If any such items of equipment, brackets and accessories, etc., have been omitted from a supplier's quotation, or incidental work is necessary, the Contractor must include for all such items and work in the tender.

Wire ways including terminal boxes to all the various installations have been allowed for under the Electrical contractor. However, it remains the responsibility of the CCTV Surveillance installers to ensure that this work is thoroughly coordinated and the necessary wireways & boxes have been allowed for.

E3.1.2.1 Location

This system set is to provide CCTV IP based Video surveillance system for the Tafalofefe Hospital, co-ordinates 32°25'46.31"S, 28°28'26.75"E

E3.1.2.2 Site Conditions

The following site conditions will be applicable and all equipment shall be capable of operation at these conditions.

a) Height above sea level - 585m
b) Ambient temperatures - 8^0C to 31^0C
c) Relative Humidity at lowest temperature - 76 %

E3.2. DETAILED SPECIFICATION

E3.2.1 SCOPE OF WORKS

The Contractor's work shall consist of, but shall not necessarily be limited to the supply, interim storage and installation of the following:

- IP based CCTV Surveillance system to provide surveillance of the site per section E3.2.3, and all the applicable details which are attached herein.
- Wiring and termination of control cables.
- System interfaces.
- Production of as-built drawings.
- Production of maintenance and operating manuals.
- Testing, commissioning and handover.
- 12 months defects liability period including service & maintenance of all the Electronic equipment.
- Installing a suitable UPS system to allow uninterruptible supply to sensitive electronic equipment.

E3.2.2 COMPONENT SPECIFICATIONS

E3.2.2.1 CCTV System

The CCTV system shall be of the highest quality, employing the latest applicable standards. The specifications of the various components of the CCTV system are to be outlined in this document. All components and sub-components of the CCTV system shall comply with the Rotakin Test where applicable, and shall offer performance capable of complying with the Rotakin test or higher .The system shall allow monitoring and live viewing via web browser, with varying access levels granted for unique users.

The CCTV system shall comprise and be capable of, but not limited to the following:

- Full on-line operation, but also allow off-line operation with no loss of functionality or security during a host or network failure.
- Allow LAN/WAN connection using TCP/IP connectivity.
- Easy to use Graphic User Interface.
- Graphic display of CCTV camera alarms and events triggered or malfunctions.
- CCTV Digital Video Recorder software integration
- Building Graphics Module
- Web Reporting
- TCP/IP Controllers
- On-line downloading of updated firmware while hardware remains in-situ.

E3.2.2.2 Host PC

This PC shall be capable of use as a dedicated host PC for communications from individual IP cameras, and switches and allowing for logging of data, live viewing and playback.

PC minimum requirements

CPU	: A high performance model released in the last 3 months, (Intel Core I7 or equivalent)
Operating System	: Windows 10 64bit, Quad 256 bit display
Memory	: 8GB
Hard Disk Space	: 1 TB
Peripherals	: DVD Multi Writer
Monitor	: 2 x 32" TFT LED
Monitor type	: Commercial Quality UHD (1080p)

The PC shall include all other ancillary equipment, namely, all the necessary operating software DVD's, Windows Operating System DVD's, Optical Wheel Mouse USB, Keyboard USB mouse, keypad et cetera.

Please Note: The PC shall come complete with the database management system software to manage the database so as allows users and other software to store and retrieve data in a structured way. A local UPS that is fed from the facility's standby generator set shall form part of this installation.

E3.2.2.3 Power supplies

The Security system shall be fed from 230 V mains power supply from the closest distribution board. The conductors shall be 2.5mm PVC insulated conductors and earth fed from a 20 amp single pole 5kA circuit breaker directly to the CCTV system. At the DB the circuit breaker shall be marked "CCTV System – Do not switch off". The labels shall be engraved 8mm high lettering, colour red on white background and shall be screwed on. This installation shall be done by the Electrical Contractor including the supply and installation of the circuit breaker.

The standby batteries for the system shall be capable of supporting the system as specified.

E3.2.2.4 Cabling

All the cabling necessary for the CCTV system forms an integral part of this contract. Good quality CAT6 cable shall be used and must be earthed as per manufacturers' specification.

Power and control cables shall conform to all the applicable SABS standards.

E3.2.2.5 Surveillance cameras

The surveillance cameras (c/w mounting brackets et cetera) are to be supplied and installed by the Security Contractor at various heights and in the positions shown (final mounting height and position to be agreed upon on site with Engineer before installation).

The tenderer shall provide a suitable free standing rack (c/w glass front, air-conditioning, fan, power, casters etc.) for housing the Network Video Recorder, Switches, Patch & Brush Panels, and all other ancillary equipment, allowing inlets for bringing in all the cabling from cameras and equipment.

The minimum requirements for the various components are as follows:

IP camera(s) specification:

The **fixed IR bullet** network cameras offered shall be 4-MP WDR Infra-red Network Bullet Camera or similar approved cameras. The cameras shall provide state-of-the-art ultra-high definition pictures, utilising H.265+, H.265, H.264+, H.264 video compression technologies and progressive scanning. Further, the cameras shall come complete with 128GB **SDHC memory cards installed.**

Camera	
Image Sensor	1/2.5" Progressive Scan CMOS
Min. Illumination	Color: 0.009 lux @(F1.2, AGC ON), 0.016 lux @(F1.6, AGC ON), 0 lux with IR
Shutter Speed	1/3 s to 1/100,000 s
Slow Shutter	Yes
Auto-Iris	No
Day & Night	IR Cut Filter
Digital Noise Reduction	3D DNR
WDR	120dB
3-Axis Adjustment	Pan: 0° to 360°, tilt: 0° to 90°, rotate: 0° to 360°
Lens	
Focal Length	2.8, 4, 6, 8, 12 mm

Aperture	F1.6
Focus	No
FOV	2.8 mm, horizontal FOV: 109°, vertical FOV: 60°, diagonal FOV: 131° 4 mm, horizontal FOV: 88°, vertical FOV: 46°, diagonal FOV: 105° 6 mm, horizontal FOV: 53°, vertical FOV: 30°, diagonal FOV: 61° 8 mm, horizontal FOV: 41°, vertical FOV: 23°, diagonal FOV: 48° 12 mm, horizontal FOV: 25°, vertical FOV: 14°, diagonal FOV: 29°
Lens Mount	M12
IR	
IR Range	Up to 30 m
Wavelength	850nm
Compression Standard	
Video Compression	Main stream: H.265/H.264 Sub-stream: H.265/H.264/MJPEG Third stream: H.265/H.264
H.264 Type	Main Profile/High Profile
H.264+	Yes
H.265 Type	Main Profile
H.265+	Yes
Video Bit Rate	32 Kbps to 16 Mbps
Smart Feature-set	
Behaviour Analysis	Line crossing detection, intrusion detection, object removal detection, unattended baggage detection
Exception Detection	Scene change detection
Face Detection	Yes
Region of Interest	Support 1 fixed region for main stream and sub-stream
Image	
Max. Resolution	2560 x 1440
Main Stream	50Hz: 25 fps (2560 x 1440, 2304 x 1296, 1920 x 1080) 60Hz: 30 fps (2560 x 1440, 2304 x 1296, 1920 x 1080)
Sub-Stream	50Hz: 25 fps (640 x 480, 640 x 360, 320 x 240) 60Hz: 30 fps (640 x 480, 640 x 360, 320 x 240)
Third Stream	50Hz: 25 fps (1280 x 720, 640 x 360, 352 x 288) 60Hz: 30 fps (1280 x 720, 640 x 360, 352 x 240)
Image Enhancement	BLC/3D DNR
Image Settings	Rotate mode, saturation, brightness, contrast, sharpness, and white balance adjustable by client software or web browser
Target Cropping	No
SVC	H.264 and H.265 encoding support
Day/Night Switch	Day/Night/Auto/Schedule
Network	
Network Storage	Support microSD/SDHC/SDXC card (128G), local storage and NAS (NFS, SMB/CIFS), ANR
Alarm Trigger	Motion detection, video tampering, network disconnected, IP address conflict, illegal login, HDD full, HDD error
Protocols	TCP/IP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP, SMTP, SNMP, IGMP, 802.1X, QoS, IPv6, Bonjour
General Function	One-key reset, anti-flicker, three streams, heartbeat, mirror, password protection, privacy mask, watermark, IP address filter
API	ONVIF (PROFILE S, PROFILE G), ISAPI
Simultaneous Live View	Up to 6 channels

User/Host	Up to 32 users 3 levels: Administrator, Operator and User
Client	iVMS-4200, Hik-Connect, iVMS-5200, iVMS-4500
Web Browser	IE8+, Chrome 31.0-44, Firefox 30.0-51, Safari 8.0+
Interface	
Video Output	No
Communication Interface	1 RJ45 10M/100M self-adaptive Ethernet port
On-board storage	Built-in microSD/SDHC/SDXC slot, up to 128 GB
Reset Button	Yes
General	
Operating Conditions	-30 °C to +60 °C (-22 °F to +140 °F), humidity 95% or less (non-condensing)
Power Supply	12 VDC ± 25%, Φ 5.5 mm coaxial plug power PoE(802.3af, class 3)
Power Consumption and Current	12 VDC, 0.5 A, max. 5.5 W PoE (802.3af, 36V to 57V), 0.2 A to 0.1 A, max. 7 W
Protection Level	IP67
Material	Metal
Dimensions	Camera: Φ70 x 155 mm (Φ2.8" x 6.1") Package: 216 x 121 x 118 mm (8.5" x 4.8" x 4.7")
Weight	Camera: 410 g (0.9 lb.)

The **vari-focal IR bullet** network cameras offered shall be 4MP IR Vari-focal Bullet Network Cameraor similar approved cameras, matching the specifications outlined. The cameras shall provide state-of-the-art ultra-high definition pictures, utilising H.265+, H.265, H.264+, H.264 video compression technologies and progressive scanning. Further, the cameras shall come complete with 128GB SDHC memory cards installed.

Camera	
Image Sensor	1/2.5" Progressive Scan CMOS
Min. Illumination	Color: 0.008 lux @(F1.2, AGC ON), 0.011 lux @(F1.4, AGC ON), 0 lux with IR
Shutter Speed	1/3 s to 1/100,000 s
Slow Shutter	Yes
Auto-Iris	No
Day & Night	IR Cut Filter
Digital Noise Reduction	3D DNR
WDR	120dB
3-Axis Adjustment	Pan: 0° to 360°, tilt: 0° to 90°, rotate: 0° to 360°
Lens	
Focal Length	2.8 to 12 mm
Aperture	F1.4
Focus	Auto
FOV	2.8 mm to 12 mm, horizontal FOV: 114° to 32°, vertical FOV: 59° to 18°, diagonal FOV: 141° to 36.5°
Lens Mount	Φ14
IR	
IR Range	Up to 50 m
Wavelength	850nm

Compression Standard	
Video Compression	Main stream: H.265/H.264 Sub stream: H.265/H.264/MJPEG Third stream: H.265/H.264
H.264 Type	Main Profile/High Profile
H.264+	Main stream supports
H.265 Type	Main Profile
H.265+	Main stream supports
Video Bit Rate	32 Kbps to 16 Mbps
Audio Compression	G.711/G.722.1/G.726/MP2L2/PCM
Audio Bit Rate	64Kbps(G.711)/16Kbps(G.722.1)/16Kbps(G.726)/32-192Kbps(MP2L2)
Smart Feature-set	
Behaviour Analysis	Line crossing detection, intrusion detection, object removal detection, unattended baggage detection
Exception Detection	Scene change detection
Face Detection	Yes
Region of Interest	Support 1 fixed region for main stream and sub-stream
Image	
Max. Resolution	2688 x 1520
Main Stream	50Hz: 25 fps (2688 x 1520, 2304 x 1296, 1920 x 1080) 60Hz: 30 fps (2688 x 1520, 2304 x 1296, 1920 x 1080)
Sub-Stream	50Hz: 25 fps (640 x 480, 640 x 360, 320 x 240) 60Hz: 30 fps (640 x 480, 640 x 360, 320 x 240)
Image Enhancement	BLC/3D DNR/HLC
Image Settings	Rotate mode, saturation, brightness, contrast, sharpness, and white balance adjustable by client software or web browser
Target Cropping	No
SVC	H.264 and H.265 encoding support
Day/Night Switch	Day/Night/Auto/Schedule/Triggered by alarm in
Network	
Network Storage	Support microSD/SDHC/SDXC card (128G), local storage and NAS (NFS,SMB/CIFS), ANR
Alarm Trigger	Motion detection, video tampering, network disconnected, IP address conflict, illegal login, HDD full, HDD error
Protocols	TCP/IP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP, SMTP, SNMP, IGMP, 802.1X, QoS, IPv6, Bonjour
General Function	One-key reset, anti-flicker, three streams, heartbeat, mirror, password protection, privacy mask, watermark, IP address filter
API	ONVIF (PROFILE S, PROFILE G), ISAPI
Simultaneous Live View	Up to 6 channels, Up to 32 users
User/Host	3 levels: Administrator, Operator and User
Client	iVMS-4200, Hik-Connect, iVMS-5200, iVMS-4500
Web Browser	IE8+, Chrome 31.0-44, Firefox 30.0-51, Safari 8.0+
Interface	
Audio	1 input (line in, 3.5 mm), 1 output (line out, 3.5 mm), mono sound
Alarm	1 input, 1 output (max. 12 VDC, 30 mA), terminal block
Video Output	1Vp-p Composite Output(75Î©) (For adjustment only)

Communication Interface	1 RJ45 10M/100M self-adaptive Ethernet port
On-board storage	Built-in microSD/SDHC/SDXC slot, up to 128 GB
Reset Button	Yes
Audio	
Environment Noise Filtering	Yes
Audio Sampling Rate	8kHz/16kHz/32kHz/44.1kHZ/48kHz
General	
Operating Conditions	-30 °C to +60 °C (-22 °F to +140 °F), humidity 95% or less (non-condensing)
Power Supply	12 VDC ± 25%, terminal block for DC input PoE(802.3at, class 4)
Power Consumption and	12 VDC, 1.2 A, max. 14.4 W
Current	PoE (802.3at, 42.5V to 57V), 0.5 A to 0.3 A, max. 18 W
Protection Level	IP67, IK10
Material	Metal
Dimensions	Φ144.1 x 332.7 mm (Φ5. 7" x 13.1")
Weight	Camera: approx. 1893 g (4.2 lb.)

The **dome IP cameras** offered shall be a WDR Infra-red 30m Network Dome or similar approved cameras with specifications as below. The cameras shall provide state-of-the-art ultra-high definition pictures, utilising H.264 compression technology and progressive scanning. Further, the cameras shall come complete with SDHC memory cards installed.

Specifications as below:

Camera	
Image Sensor	1/2.8" Progressive Scan CMOS
Min. Illumination	Color: 0.005 lux @(F1.2, AGC ON), 0 lux with IR
Shutter Speed	1/3 s to 1/100,000 s
Slow Shutter	Support
Lens	2.8 mm, horizontal field of view: 108° 4 mm, horizontal field of view: 86.4° 6 mm, horizontal field of view: 52° 8 mm, horizontal field of view: 40° 12 mm, horizontal field of view: 25°
Lens Mount	M12
Iris	F1.6
Day &Night	IR cut filter
DNR	3D DNR
Wide Dynamic Range	120dB
3-Axis Adjustment	Pan: 0° to 355° , tilt: 0° to 75°, rotate: 0° to 355°
Compression Standard	
Video Compression	Main stream: H.265/H.264 Sub stream: H.265/H.264/MJPEG Third stream: H.265/H.264
H.264 Type	Main Profile/High Profile
H.264+	Support
H.265 Type	Main Profile
H.265+	Support

Video Bit Rate	32 Kbps to 16 Mbps
Audio Compression (-S)	G.711/G.722.1/G.726/MP2L2
Audio Bit Rate (-S)	64Kbps(G.711)/16Kbps(G.722.1)/16Kbps(G.726)/32-128Kbps(MP2L2)
Image	
Max. Resolution	1920 x 1080
Main Stream	50Hz: 25fps (1920 x 1080, 1280 x 960, 1280 x 720) 60Hz: 30fps (1920 x 1080, 1280 x 960, 1280 x 720)
Sub Stream	50Hz: 25fps (640 x 360, 352 x 288) 60Hz: 30fps (640 x 360, 352 x 240)
Third Stream	50Hz: 25fps (1920 x 1080, 1280 x 720, 640 x 360, 352 x 288) 60Hz: 30fps (1920 x 1080, 1280 x 720, 640 x 360, 352 x 240)
Image Enhancement	BLC/3D DNR
Image Settings	Support rotate mode. Brightness, contrast, saturation, and sharpness are adjustable via web browser and client software
ROI (Region of Interest)	Support 1 fixed region for mainstream and sub stream separately
Day/Night Switch	Auto/Scheduled/Alarm Triggered (-S)
Audio (-S)	
Environment Noise Filtering	Support
Audio I/O	Support, mono soundtrack
Network	
Network Storage	Support microSD/SDHC/SDXC card (128G) local storage, NAS (NFS,SMB/CIFS), ANR
Alarm Trigger	Motion Detection, Tampering Alarm, Network Disconnected, IP Address Conflict, Illegal Login,HDD full, HDD error
Protocols	TCP/IP, UDP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP,SMTP, SNMP, IGMP, 802.1X, QoS, IPv6
Standard	ONVIF (PROFILE S, PROFILE G), PSIA, CGI, ISAPI
General Function	One-key Reset , Anti-Flicker, Heartbeat, Mirror, Password Protection, Privacy Mask, Watermark, IP Address Filter
Interface	
Communication Interface	1 RJ45 10M/100M self-adaptive Ethernet port
Audio (-S)	1 audio input (line in), 1 audio output interface
Alarm (-S)	1 alarm input, 1 alarm output
On-board Storage	Built-in microSD/SDHC/SDXC slot, up to 128 GB
Smart Feature-set	
Behaviour Analysis	Line crossing detection, intrusion detection, unattended baggage detection, object removal detection
Line Crossing Detection	Cross a pre-defined virtual line, up to 1 pre-defined virtual lines supported
Intrusion Detection	Enter and loiter in a pre-defined virtual region, up to 1 pre-defined virtual regions supported
Object Removal Detection	Objects removed from the pre-defined region, such as the exhibits on display.
Unattended Baggage Detection	Objects left over in the pre-defined region such as the baggage, purse, dangerous materials
Face Detection	Human face appears in the image can be detected and trigger linkage method
General	
Operating Conditions	-30 °C to +60 °C (-22 °F to +140 °F), Humidity 95% or less (non-condensing)

Power Supply	12 VDC ± 25%, 5W PoE(802.3af, class 3), 6.5W
IR Range	Up to 30 m
Protection Level	IP67, IK10
Dimensions	Camera: Φ111 x 82.4 mm (Φ 4.4" x 3.2")
	Package: 134 x 134 x 108 mm (5.27" x 5.27" x 4.25")
Weight	Camera: 500 g (1.1 lb.)

E3.2.2.6 Monitor specification

- Commercial Quality 32" TFT LED
- High Resolution UHD (3840 x 2160)
- Colour
- High viewing angle
- Under/Over scan function

E3.2.2.7 Network Video Recorder specification

The NVR shall come complete with the required licences and any other items necessary for full functionality

Video/Audio Input	
IP video input:	32-ch Up to 12MP resolution
Two-way audio	1-ch, RCA (2.0 Vp-p, 1kΩ)
Network	
Remote connection:	128
Incoming bandwidth:	256Mbps
Outgoing bandwidth:	256Mbps
Video/Audio Output	
Recording resolution	12 MP/8 MP/6 MP/5 MP/4 MP/3 MP/1080p/UXGA/720p/VGA /4CIF /DCIF/ 2CIF/CIF/QCIF
CVBS output (Optional)	1-ch, BNC (1.0 Vp-p, 75 Ω), resolution: PAL: 704 × 576, NTSC: 704 × 480
HDMI output resolution	4K (3840 × 2160)/60Hz, 4K (3840 × 2160)/30Hz, 1920 × 1080p/60Hz, 1600 × 1200/60Hz, 1280 × 1024/60Hz, 1280 × 720/60Hz, 1024 × 768/60Hz
VGA output resolution	1920 × 1080p/60Hz, 1280 × 1024/60Hz, 1280 × 720/60Hz, 1024 × 768/60Hz
Audio output	1-ch, RCA (Linear, 1 KΩ)
Decoding	
Decoding format	H.265/H.265+/H.264/H.264+/MPEG4
Live view / Playback resolution	12 MP/8 MP/6 MP/5 MP/4 MP/3 MP/1080p/UXGA/720p/VGA/4CIF /DCIF/ 2CIF/CIF/QCIF
Synchronous playback	32-ch
Capability	2-ch @ 12 MP (20fps) / 4-ch @ 8 MP (25fps) / 8-ch @ 4MP (30fps) / 16-ch @ 1080p (30fps)

Network management	
Network protocols	TCP/IP, DHCP, Hik-Connect, DNS, DDNS, NTP, SADP, SMTP, NFS, iSCSI, UPnP™, HTTPS
Hard Disk	
SATA:	4 SATA interfaces for 4HDDs
Capacity:	Up to 6TB capacity for each HDD
External Interface	
Network Interface:	1RJ-45 10/100/1000Mbps self-adaptive Ethernet interface
Serial Interface:	1 RS-485 (half-duplex), 1 RS-232
USB Interface:	Front panel: 2 × USB 2.0; Rear panel: 1 × USB 3.0
Alarm In:	16-ch
Alarm Out:	4-ch
POE	
Supported Standard:	IEEE 802.3 af/at
Interface:	16 independent 10/100 Mbps PoE Ethernet interfaces
Max. Power:	200W
General	
Power Supply:	100 to 240 VAC
Power	≤300 W
Consumption(without hard disk and POE):	≤20 W
Working Temperature:	-10 °C to +55 °C (+14 °F + 131 °F)
Working Humidity:	10 % ~ 90 %
Chassis:	19-inch rack-mounted 1.5U chassis
Dimensions:	445 × 390 × 70 mm (17.5"× 15.3" × 2.8")
Weight(without HDD):	≤ 5 Kg (11 lb)

Transmission medium specification:

- CAT6

HDD specification:

The hard drives to be used are to be of surveillance grade quality and performance, supporting SATA interface and 6GB/s.

Formatted capacity	4TB
Form factor	3.5-inch
Advanced Format (AF)	Yes
RoHS compliant	Yes
Product Features	
Cameras supported	Up to 64
Drive Bays Supported	8+

Firmware Feature Name	AllFrame 4K
Tarnish resistant components	Yes
Performance	
Interface transfer rate (max)5	
Buffer to host	6 Gb/s
Host to/from drive (sustained)	150 MB/s
Cache (MB)	64
Performance Class	5400 RPM Class
Reliability/Data Integrity	
Load/unload cycles	300,000
Annualized workload rating	180TB/yr
Non-recoverable read errors per bits read	<1 in 10^{14}
MTBF	1,000,000
Limited warranty (years)	3
Power Management	
Average power requirements (W)	
Read/Write	5.1
Idle	4.5
Standby and Sleep	0.4
Environmental Specifications	
Temperature (°C, on the base casting)	
Operating	0 to 65
Non-operating	-40 to 70
Shock (Gs)	
Operating (2 ms, read/write)	30
Operating (2 ms, read)	65
Non-operating (2 ms)	250
Acoustics (dBA)	
Idle	25
Seek (average)	28
Physical Dimensions	
Height (in./mm, max)	
Length (in./mm, max)	1.028/26.1
Width (in./mm, ± .01 in.)	5.787/147
Non-operating (2 ms)	4/101.6
Weight (lbs/kg, ±10%)	1.65/0.75

E3.2.2.8 Network IP Switch

The network switch shall be capable of the following:

Model	
Port	
10/100M RJ45	24
10/100/1000M RJ45	2
1000M SFP	2 (multiplex)
Port of high priority	Port 1 to 8
Performance	
Store-and -forward	Support
MAC Address table	4K
MAC address learning	Automatic learning/Aging
Backplane bandwidth	8.8Gbps
PoE	
PoE standard	IEEE 802.3af, IEEE802.3at
PoE cable core	Supports 8-core power supply and simultaneous power supply via the 1236 and 4578 line order.
PoE port	Port 1 to 24
Port max. power	30W
Switch max. power	370W
Power Supply	100to 240VAC, 50/60Hz
Data Transfer rate	Ethernet: 10 Mbps (half-duplex)/20 Mbps (full-duplex) Fast Ethernet: 100 Mbps (half-duplex)/200 Mbps (full-duplex) Gigabit Ethernet: 2000 Mbps (full-duplex)
Network Media	
Ethernet	UTP/STP of CAT3 or above
Fast Ethernet	UTP/STP of CAT5 or above
Gigabit Ethernet	Recommended UTP/STP of CAT5e or CAT6
1000 Base-SX:	MMF (Multi-Mode Fiber)
1000 Base-LX:	MMF (Multi-Mode Fiber) or SMF (Single Mode Fiber)

E3.2.2.9 Gigabit Ethernet Unmanaged Switch

The Gigabit switch shall have the following specification

Product Specifications	
Gigabit ports	8
Max MAC entries	4K
Buffer size	192KB
Energy Efficient Enthernet (IEEE 802.3az compliant)	Yes
Performance	
Store-and -forward	Yes
Bandwidth	16Gbps
Jumbo Frame Support(packet size)	Up to 9,720 bytes
Acoustic noise (ANSI-S10.12)	0 dBA (fanless)
Mean Time Between Failures (MTBF)	9,727,733 hrs (158 yrs)
Quality of Service	
DSCP	Yes
IEEE 802.1p COS	Yes
Queue WRR Ratio	1:2:4:8
IEEE NETWORK PROTOCOLS	
IEEE 802.3 Ethernet	IEEE 802.1p Class of Service
IEEE 802.3ab 1000BASE-T	IEEE 802.3x full-duplex flow control
LEDs	
Per port	Speed, Link, Activity
Per device	Power Status
Power Specifications	
Power Consumption (when all ports used, line-rate traffic)	4.9W

E3.2.3 GENERAL DESCRIPTION – CCTV SYSTEM

The CCTV system shall be of first class comprising of various components to provide surveillance capabilities to the CCTV control room (master station) of the hospital. The system offered shall integrate all the different components and shall work as one package controlled from a single point, but also capable of being controlled individually.

E3.2.3.1 Display System

The display system shall comprise of a suitable 32 inch UHD LED monitor, as well as cables, connectors and all other ancillary equipment necessary to complete the installation.

E3.2.3.2 PC input points and switching

The system offered shall be simple, flexible to configure and an elegant solution. The system shall have a VGA & audio point mounted in the power skirting below the screen and it shall come c/w all the necessary control cables and connectors.

E3.2.3.3 UPS System

The system shall have a dedicated rackmounted 3kVA Online UPS system capable of allowing uninterruptible supply to sensitive equipment for a period not less than 30mins after power disconnection. The UPS system shall be used for all sensitive equipment, including monitoring equipment, Host PC, NVR and other network switching equipment.

UPS Specification

Model	1kVA	3kVA
Phase	Single phase with ground	
Capacity	1000 VA / 800 W	3000 VA / 2400 W
Input		
Low Line Transfer	160 VAC/140 VAC/120 VAC/110 VAC ± 5% (Ambient Temp.<35°C) (based on load percentage 100% - 80 % / 80 % - 70 % / 70 - 60 % / 60 % - 0)	
Low Line Comeback	175 VAC /155 VAC/ 135 VAC /125 VAC± 5 % (Ambient Temp.<35°C) (based on load percentage 100% - 80 % / 80 % - 70 % / 70 - 60 % / 60 % - 0)	
High Line Transfer	300 VAC ± 5 %	
High Line Comeback	290 VAC ± 5 %	
Frequency range	40Hz ~ 70 Hz	
Power Factor	≧ 0.99 @ nominal voltage	
OUTPUT		
Output Voltage	200/208/220/230/240 VAC	
AC Voltage Regulation (Batt. Mode)	± 1%	
Frequency Range (Synchronized Range)	47 ~ 53 Hz or 57 ~ 63 Hz	
Frequency Range (Batt. Mode)	50 Hz ± 0.25 Hz or 60Hz ± 0.3 Hz	
Current Crest Ratio	3:1	
Harmonic Distortion	≦ 3 % THD (Linear Load), ≦ 6% THD (non-linear load)	

	370W	
Waveform (Batt. Mode)	Pure Sinewave	
EFFICIENCY	Not less than 89%	
BATTERY		
Battery type	12 V / 9 Ah	
Number	2	6
Typical Recharge time	4 hours recover to 90% capacity	
Max Charging current	1.0 A	
Charging voltage	27.4 VDC ± 1%	82.1 VDC ±1%
INDICATORS		
LCD Panel	UPS status, Load level, Battery level, Input/Output voltage, Discharge timer, and Fault conditions	
ALARM		
Battery Mode	Sounding every 4 seconds	
Low Battery	Sounding every second	
Overload	Sounding twice every second	
Fault	Continuously sounding	
Physical		
Dimensions	310 x 483 x 88 [2U]	630 x 483 x 88 [2U]
Net Weight (kgs)	12	29.3
Noise Level	Less than 50dB @ 1 Meter	
Management		
Smart RS-232/USB	Supports Windows 2000/2003/XP/Vista/ 2008, Windows 7/8, Linux, Unix, and MAC	
Optional SNMP	Power management from SNMP manager and web browser	

E3.2.3.4 Rack Cabinet

A 24U cabinet shall be made available to house equipment, as specified by the Engineer. Contractor is to consult with Engineer before purchase of cabinet. Cabinet should be large enough to house the rack mounted UPS as specified.

E3.2.4 TYPICAL TOPOLOGY – CCTV SYSTEM

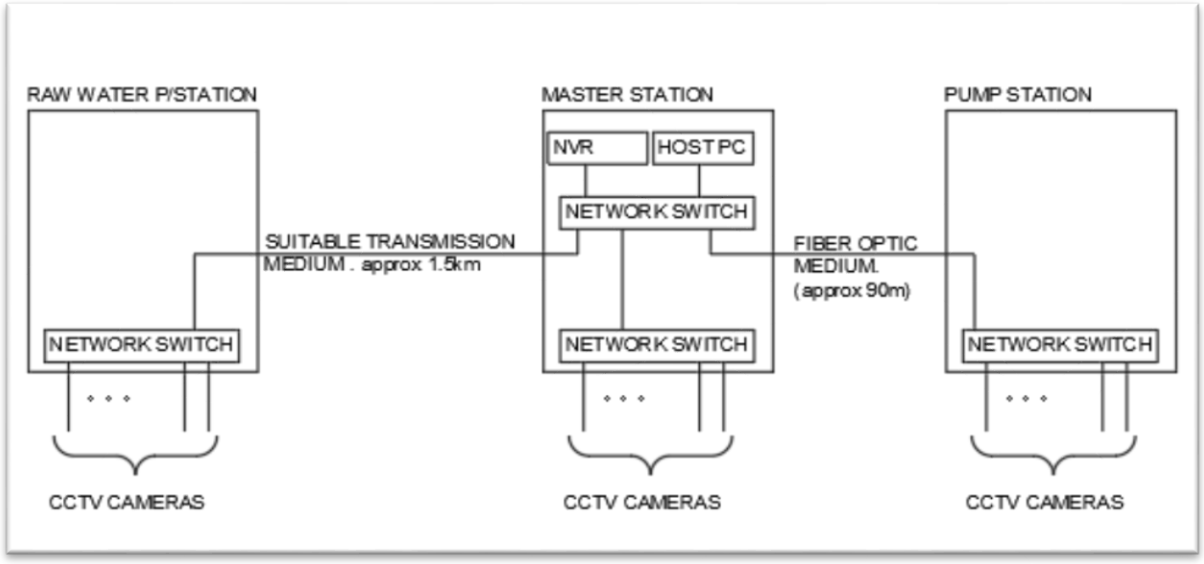


Figure 2.3 – Typical Topology of System

E3.3. TESTS AND COMMISSIONING

E3.3.1 GENERAL

The Contractor shall draw up procedures for and execute the following tests and inspections:

- Site tests.
- Acceptance tests.

The Employer and Engineer will have the right to attend any or all tests and inspections.

The Contractor must supply all the necessary test equipment to execute the tests.

All completed test and inspection reports must be submitted to the Engineer before acceptance of the system.

The Contractor must execute all tests and submit completed test reports to the Engineer. The Engineer shall have the right to request the Contractor to perform all or some tests in the presence of the Engineer and the Employer.

In the event of failure of the system to pass any of the tests, a re-test will be required within 14 days of the original test. The cost associated with all re-tests will be for the account of the Contractor.

E3.3.2 SITE TESTS

Site tests must be executed on all systems/modules before integration of the system takes place.

The site tests must ensure that all sub-systems function according to the specifications and comply with the specification.

The site test procedures must contain at least the following:

(i) Sub-system/module description and identification number.

(ii) Test equipment needed/used.

Logical explanation of actions and/or measurements to be taken in order to determine the compliance with the specifications.

(iv) Test reports containing the following:

- Specified values/requirements.
  - Measures/observed values/requirements.
  - Remarks.
  - Name and capacity of person that performed the tests.
  - Date of tests.
- Space for acceptance of the test report by the Engineer.

The test procedures must be submitted to the Engineer for approval at least two weeks before the scheduled tests.

E3.3.3 ACCEPTANCE TESTS AND COMMISIONING

Acceptance tests shall be executed on the integrated system as a whole before the first delivery can take place.

Successful completion of the acceptance tests will serve as proof that the system is functioning as required. No handing over of the system or execution of Tests on Completion in terms of the Contract shall take place before the Engineer is satisfied that the system conforms to specification.

E3.3.4 TRAINING OF OPERATING STAFF

The Contractor shall undertake to train the Employer's operating staff to be fully competent in the operation of the equipment.

Before or on completion of the installation, when the system is in running order, the Contractor shall instruct operators in the operation of the system until they are fully conversant with the equipment and the handling thereof.

The Contractor shall take full responsibility for the safety of personnel during training and for the quality of work produced by such personnel under his supervision.

Training of staff and personnel shall be equivalent to eight full hours of training, done over two to three days.

E3.3.5 WARRANTY PERIOD

It shall be possible to do maintenance in one equipment section, without interfering with the other parts of the CCTV system.

The contractor shall include in the tender price a "free" warranty period of 12 months. This shall include all repairs/replacement of defective equipment.

When any equipment becomes defective during the warranty period the Contractor will be contacted by the Employer to repair or replace the defective equipment.

E3.3.6 SCHEDULES OF PARTICULARS AND INFORMATION

All schedules which accompany this tender notice, form an integral part of it and shall be duly completed in every detail; **FAILING** which, the tender in question may be rendered ineligible for consideration.

Under no circumstances will statements such as: -

- See attached pamphlets
- Refer to catalogue
- Data to follow
- As given by supplier, etc. be acceptable to the OTP.

Equipment offered and listed on the schedules shall be capable of performing the specified duties and complying with the Specification requirements in all respects; Should it transpire that such equipment, even when offered by make, model and/or type, is unsuitable of meeting, or performing in accordance with, the Specification requirements in any respect, the Contractor shall nevertheless be responsible for any additional costs incurred in providing the required or suitable equipment.

The schedules on the following page/s must be completed in full and returned with the tender. Blank statements of compliance will not be considered.

NOTE:

Tenderers are to note that under no circumstances may materials be installed other than that offered in the following material schedule.

E3.3.7 OPERATING AND MAINTENANCE MANUALS

OPERATING MANUALS

The Sub-Contractor shall supply as part of the contract three (3) copies of the Operation Manual and "As Built" drawings of the complete system.

(a) The Manuals shall contain the name, address and all telephone numbers of the Company supplying and installing the specific system.

(b) The location of the main switch that isolates all power to the system.

(c) Details of maintenance service agreement as specified in this section.

The Manuals must be compiled in layman's language.

At least one month before commissioning, one draft copy shall be submitted to the Engineer for comments and approval. Operating manuals shall give a clear description of and the purpose of the installation.

(a) Paper copies of all approved drawings and diagrams.

(b) Detailed description of the different components used in the installation.

(c) On- and off switching procedures.

(d) Guidelines for routine-test to be carried out by the End User inclusive of the periods during which tests are to be undertaken.

(e) Detailed instructions for procedures to be followed during a fault or alarm.

The Sub-Contractor shall in addition to documentation specified above and/or in the Standard Specifications furnish the Engineer with two sets of documents and drawings related to the concept, design, installation, commissioning, operation and maintenance of the entire system and its components, on or before the First Delivery date.

The following drawings are required:

- Layout drawings
- Schematic drawings
- Internal circuit drawings and schematic circuit drawings of all panels, etc.

The following documents are required:

- Full description of the system.
- Operating instructions**.**
- Installation instructions.
- Commissioning instructions.
- Maintenance instructions, maintenance schedule and troubleshooting guide.
- Parts Books, Spares Books and Log Book
- Inspection Certificates and Reports

E3.3.8 MAINTENANCE MANUALS

Three complete sets of maintenance manuals (Technical) prepared in English shall be supplied by the Contractor.

At least one month before commissioning a draft copy shall be submitted to the Engineer for comments and approval.

Maintenance manuals shall consist of the following:

(a) A general description of the system.
(b) A general description of the controls.
(d) Detailed monthly, quarterly, semi-annually and annual preventative maintenance procedures (if necessary).
(e) Manufacturer's catalogues clearly indicating type, and model of equipment supplied.
(h) List of spare parts for all equipment.
(i) Fault tracing/finding procedures.

Manuals shall be bound in a firm hard cover.

The information shall be clear and readable and supplied with an index.

The above mentioned manuals shall be available at first delivery. Delivery of the installation will not be accepted without the manuals.

E3.3.9 AS-BUILT DRAWINGS

The as-built drawings shall contain the following (where installed):

- position and types of all field devices
- conduit and trunking routes and sizes

E3.4. DEVIATIONS FROM THE SPECIFICATION

Explanatory remarks with regard to special technical characteristics of the Tender, or with regard to variations to the design of the building structure to house the installation or remarks regarding the contents of the Specification, shall be comprehensively described in the blank space provided on this page (or in an accompanying letter). Should no remarks be made or special requirements stated, it shall be interpreted that the installation offered in the Tender duly complies with the requirements of the Specification. Should remarks of requirements be included in an accompanying letter, the Tenderer shall so state in the space provided on this page.

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……

……

……

……

SIGNATURE OF TENDERER: ……..

E3.5 SCHEDULES OF INFORMATION

NOTE :

THE FOLLOWING SCHEDULES SHALL BE COMPLETED IN FULL. FAILURE TO DO SO WILL RESULT IN THE TENDER BEING DECLARED NULL AND VOID

E3.5.1 SCHEDULE OF TECHNICAL INFORMATION

1.		**MONITORS**	
	(i) (II)	Make Model	…… ……
2.		**PC INPUT POINTS & SWITCHING**	
	(i) (II)	Make Model	…… ……
3.		**VARI FOCUS IP CAMERAS**	
	(i) (II)	Make Model	
4.		**FIXED IP CAMERAS**	
	(i) (II)	Make Model	…… ……
5.		**DOME IP CAMERAS**	
	(i) (II)	Make Model	…… ……
6.		**NETWORK VIDEO RECORDER**	
	(i) (II)	Make Model	…… ……
7.		**NETWORK SWITCH**	
	(i) (II)	Make Model	
8.		**RACKMOUNTED UPS (1kVA)**	
	(i) (II)	Make Model	
9.		**RACKMOUNTED UPS (3kVA)**	
	(i) (II)	Make Model	
10.		**GIG SWITCH**	
	(i) (II)	Make Model	

11.		**SURVEILLANCE HARD DRIVE**	
	(i) (II)	Make Model	

E3.5.2 PREVIOUS EXPERIENCE

CCTV System

Previous Contracts	Value	Reference: Name & Number

ICT

Previous Contracts	Value	Reference: Name & Number

Surveillance

Previous Contracts	Value	Reference: Name & Number

Building Management System

Previous Contracts	Value	Reference: Name & Number

E3.6. SCHEDULE OF RATES FOR VARIATIONS TO THE CONTRACT

E3.6.1 SCHEDULE OF RATES

THE SCHEDULES OF RATES SHALL BE COMPLETED IN FULL. FAILURE TO DO SO WILL RESULT IN THE TENDER BEING NULLIFIED

The rates entered in this schedule shall serve unaltered to calculate the value of variation orders (additions or omissions) issued in terms of the Contract.

All rates in this bill shall be given to ensure that these rates are available for variation orders covering work not envisaged at the tender stage.

These rates shall include the following items necessary for the supply, delivery, handling, installation and guarantee of all applicable equipment:

- Nett cost of material.
- Profit, storing cost, handling charges, etc. for material.
- Nett cost of labour.
- Labour overheads and profit on labour.
- Duties payable.
- Attributable overhead costs.

These rates shall exclude VAT.

E3.6.2 PROFIT ON MATERIAL FOR OMISSIONS AND ADDITIONS:

The following percentage profit will be required on the proven cost of materials for additions or omissions not covered by any other section of this schedule. This percentage shall include all direct overheads, profit handling charges, etc.

Nett percentage: .....%

E3.6.3 RATES FOR ADDITIONAL LABOUR

The rate per man-hour shall be applied to determine labour costs not covered by any of the other section of this schedule.

PERSONNEL	**RATE, R PER MAN-HOUR**
NORMAL HOURS	
Supervisor	……
Qualified artisan	……
Skilled Labourer	……
Semi-skilled Labourer	……
19H00 - 07H00 OVERTIME WEEKLY	
Supervisor	……
Qualified artisan	……
Skilled Labourer	……
Semi-skilled Labourer	……
OVERTIME WEEKENDS AND PUBLIC HOLIDAYS	
Supervisor	……
Qualified artisan	……
Skilled Labourer	……
Semi-skilled Labourer	……

E3.7. SCHEDULE OF IMPORTED MATERIALS AND EQUIPMENT
TO BE COMPLETED BY TENDERER

Item	Material/Equipment	Rand (R) (Excluding VAT)
1		
2		
3		
4		
5		
6		

The Contractor shall list imported items, materials and/or equipment, which shall be excluded from the Contract Price Adjustment Provisions and shall be adjusted in terms of currency fluctuations only. Copies of the supplier's quotations for the items, materials or equipment (provided that such costs shall not be higher than the relevant contract rate as listed above) should be lodged with the Representative of the Client within 60 (sixty) days from the date of acceptance of the tenders. No adjustment of the local VAT amount, nor the contractor's profit, discount, markup, handling costs, etc shall be allowed.

These net amounts will be adjusted as follows

FORMULA:

The net amount to be added to or deducted from the contract sum:

$$A = V \left(\frac{Z}{Y} - 1 \right)$$

A = the amount (R) of adjustment

V = the net amount (supplier's quotation) (R) of the imported item

Y = exchange rate at the closing date of tender submission

Z = exchange rate on the date of payment.

CONTRACTOR: _____

SIGNED: _____

DATE: _____

PORTION 3

SPECIALIST WORKS

ELECTRICAL SPECIFICATION

TAFALOFEFE HOSPITAL – WATER AND WASTEWATER TREATMENT WORKS

SCMU5-24/25-0037

Portion 3.1: Electronic Surveillance Specification
Portion 3.2: Electrical Specification (**This document**)
Portion 3.3: Indoor Generator Set Specification

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E1 SPECIFIC CONTRACT SPECIFICATIONS

The General Conditions of Contract for Construction Works, 3rd Edition (2015), published by the South African Institution of Civil Engineering, is applicable to this development and the liability of the tenderer shall be governed by the aforementioned contract. The electrical works shall be carried out as a subcontract under the main contract.

E1.1 CONTRACTOR DESIGN AND OBLIGATIONS

The drawings included in this document represent a systems design defining the requirements of the Employer.

The Contractor shall be responsible for the workshop drawings and wiring diagrams required for the manufacturing and installation of motor control centres and instrumentation.

E1.2 QUALITY OF MATERIALS

Only materials of first-class quality shall be used and all materials shall be subject to the approval of the employer's agent prior to installation. Departmental specifications for various materials to be used on this contract such as department public works and infrastructure standard electrical specification (section A, B and C) are not attached but form part of this specification and available on the department website and from the employer's agent on request.

Wherever applicable the material is to comply with the relevant South African Bureau of Standards, department of public works and infrastructure electrical specifications which are available or to IEC Specifications, where no SANS specifications exist.

Materials wherever possible, must be of South African manufacture.

E1.3 TRAINING AND MAINTENANCE DURING DEFECT LIABILITY PERIOD

The Contractor shall inform the Engineer on the completion of the project and provide training to the person(s) responsible for the operation and maintenance of the project. The training shall be conducted for a period equivalent to 8 hours, starting with the basic information and getting into detail as time progresses. The training will be scattered into a minimum of 2 days. Training shall not be conducted unless materials and planned procedure is approved by the Engineer and the client representative. The number of personnel to attend the training shall be determined by the Client and contractor to ensure they all have training material as may be required.

During the defect liability period, the Contractor shall be responsible for the complete maintenance of equipment and plant according to the suppliers/manufacturer's specifications. Maintenance of the installation shall mean the regular servicing, lubrication, repairing, cleaning and adjustment of the installation as recommended by the manufacturers as well as the free of charge replacement of any defective components during this period.

A suitably qualified and trained person shall routinely and regularly examine and test the installation once every 3 months and shall also perform all the necessary maintenance tasks to ensure smooth and faultless operation. A quarterly report shall be submitted to the Engineer.

The Contractor shall immediately, on the day of first call-out, attend to breakdown/emergency calls. In the event of non-performance by the Contractor in this respect, the employer shall be entitled to make such other arrangements as are necessary, the cost of which shall be for the Contractor's account or deductible from any outstanding retention monies.

A logbook shall be kept and all servicing and repairs shall be recorded in this logbook with meticulous care. The logbook shall at all times be put at the disposal of the Engineer. The Contractor shall issue the logbook with full record of all services and repairs to the employer after the defect liability period has expired.

E1.4 OPERATION AND MAINTENANCE MANUALS

Three (3) sets of comprehensive operating instructions and maintenance procedures shall be provided on completion of the commissioning of the installation

One draft copy shall be submitted for scrutiny PRIOR to any commissioning.

E1.5 FIRE EXTINGUISHERS

Portable fire extinguishers containing liquefiable gaseous halons for Class S, B, C and E fires shall be installed in pump station and blower room. Areas with a room floor area not exceeding 50m² shall be equipped with a 2.5kg unit and rooms bigger than 50m² shall be equipped with a 4kg unit and equivalent mass of smaller units. In structures where more than one room is incorporated, housing different hazardous points, each room shall be equipped with appropriate extinguishers, e.g. a generator room with a separate fuel store.

Portable extinguisher shall comply with SANS 0105. Fire extinguishers shall be installed near exits or along exit routes in conspicuous and unobstructed positions and marked with conspicuous signboards. The extinguisher must be so installed that the carrying handle is 1.25m above floor.

Extinguishers that are to be mounted outside and adjacent to the main entrance door shall be mounted with a suitable cupboard.

E1.6 PLANNING AND PROGRAMING

The Contractor shall provide and maintain a detail construction program indicating duration of all manufacturing processes, transportation, delivery and installation dates.

There are no constraints on the execution of the work. However, any disruption of the normal working of the plant must be planned and co-ordinated in conjunction with the Engineer and Client

E1.7 SEQUENCE OF WORK

The electrical works shall be coordinated with the mechanical and civil works to ensure smooth execution.

E1.8 OTHER CONTRACTORS ON SITE

Should other contractors be required on site coordination between the concerned parties would be essential and this should not interfere with the works under this contract in any significant way.

E1.9 FORMAT OF COMMUNICATION

All verbal communication shall be confirmed in writing either by means of site instruction, letter or e-mail.

E1.10 KEY PERSONNEL

The electrical contractor shall have a registered installation electrician and he must have full control over all the electrical works as required by the OHS Act.

E2 ELECTRICAL SPECIFICATION

This part of the specification covers the electrical technical requirements of the new pump stations and blower room. Should there be any discrepancy between the Electrical General Technical Specification and the Electrical Particular Specification the latter shall have precedence.

E2.1 ELECTRICAL PARTICULAR SPECIFICATION

E2.1.1 MOTOR CONTROL CENTRE (MCC) CONSTRUCTION

Blower Motors (5.5kW)

Supply and install new MCC to control new 5.5kW blower motors which will start on variable speed drive with built in active front end rectifiers to reduce harmonics and it should fit in the existing 4x5m blower room with 3.4m clearance to the soffit of the concrete roof, the panel arrangement and controls shall be similar in general arrangement to drawings CAR18-1807E-001 and CAR18-1807E-002.

The MCC is to be manufactured from 3CR12 with a minimum thickness of 1.5mm. The MCC is to be light orange with smooth white back plates, finished from baked enamel with dry fil thickness of at least 0.1mm. Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough unbroken metal-phosphate film and then thoroughly dried. The paint shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg.

The MCC shall be IP 54 rated and shall be specifically sized for the equipment for which it is to house. The MCC shall be designed in such a way that adequate heat dissipation is accomplished in order to prevent any de-rating of equipment or premature tripping of circuit breakers or any other electrical devices.

WTP Motors (50kW,10kW,5kW)

Supply and install new MCC to be housed in the new equipment building next to the existing raw water steel tank, proposed water treatment plant and new fire water tank, this MCC will control a local 3kW domestic booster pump motor, 50kW fire booster pump motor and provide electrical supply to the 10kW water treatment package plant (WTP) motor, the controls for WTP will be provided by the specialist however data should be extracted for transfer to the control room SCADA. The MCC should designed in similar general arrangement to drawing CAR18-1807E-001 and CAR18-1807E-002.

The MCC is to be manufactured from 3CR12 with a minimum thickness of 1.5mm. The MCC is to be light orange with smooth white back plates, finished from baked enamel with dry fil thickness of at least 0.1mm. Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough unbroken metal-phosphate film and then thoroughly dried. The paint shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg.

The MCC shall be IP 54 rated and shall be specifically sized for the equipment for which it is to house. The MCC shall be designed in such a way that adequate heat dissipation is accomplished in order to prevent any de-rating of equipment or premature tripping of circuit breakers or any other electrical devices.

Submersible Motor (0.2kW)

Supply and install new MCC to be housed in the existing filter room opposite to the existing distribution board this will start on direct online starter and will control 0.2kW jockey pump motor.

The MCC is to be manufactured from 3CR12 with a minimum thickness of 1.5mm. The MCC is to be light orange with smooth white back plates, finished from baked enamel with dry fil thickness of at least 0.1mm. Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough unbroken metal-phosphate film and then thoroughly dried. The paint shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg.

The MCC shall be IP 54 rated and shall be specifically sized for the equipment for which it is to house. The MCC shall be designed in such a way that adequate heat dissipation is accomplished in order to prevent any de-rating of equipment or premature tripping of circuit breakers or any other electrical devices.

Variable Speed Drive (VSD)

All electrical motors including blower motor shall started using variable speed, only the submersible pump motor shall start using direct online starter. Each variable speed drive shall be rated at the rating of the motor and shall digital keypad and display screen with keys such as run, stop/reset, forward or reverse, hand, auto, and menu etc. It shall be designed to fit inside the MCC and shall have a built-in active front end rectifiers to reduce harmonics. It shall be rated at minimum input voltage of 230V phase to neutral and 400V phase to phase and shall have a minimum overload tolerance of 120% of rated current for at least 1 minutes every 5 minutes and a minimum 160% of rated current for 3 seconds during every 25 seconds.

E2.1.1.1 POWER COMPONENTS

All main incoming components such as isolators or circuit breakers shall accommodate a three-phase rotary isolator interlocked with the panel door, such that the door cannot be opened with the isolator or circuit breaker in the ON position.

E2.1.1.2 ELECTRONIC CONTROL EQUIPMENT

Any electronic component that is sensitive to electromagnetic interference shall be mounted in a location that prohibits such interference. Similarly, the mounting of components that emit heat shall be mounted in a position that does not interfere with other components operation.

The below equipment shall be mounted on the removable base plate in the MCC.

- Moulded Case Circuit Breaker
- Overload Relays
- Contactors
- Relays
- Low Voltage Power Supplies
- Variable Speed Drives
- RTU's

E2.1.1.3 INDICATION LIGHTS

The MCC door for the corresponding starter shall accommodate its indicator lights.

The purpose of the indicator lights is to clearly indicate the following parameters from any place in the pump station.

- Pump running (green)
- Emergency stop pressed (yellow)
- Pump trip (red)
- Closed valve (white)

The lights shall be adequately sized / labelled and shall be clearly visible from any position in the pump station.

Samples of the indicator lights must be brought to site and tested prior to installation

E2.1.1.4 METERING

A digital multimeter shall from the main supply be able to display: current(A), power factor (PF), phase and line voltages(V), power(kW), apparent power (kVA), reactive power (kvar) and frequency.

Each running hour meter shall record and display the running hours of each pump either duty or standby.

E2.1.1.4 PUSHBUTTONS AND SELECTOR SWITCHES

All push buttons must be of the spring release type and colour coded and labelled as follows:

- Start (Green)
- Stop (Red)
- Reset (Black)
- Lamp test (Yellow)

A three-position selector switch must be positioned on each pump station panel door and labelled as follows:

- Position 1 (Manual)
- Position 2 (Off)
- Position 3 (Automatic)

E2.1.1.5 EMERGENCY STOP BUTTONS

An emergency stop push-button of the twist and release type must be positioned on the door of each motor starter for all motor control centres with an indication label.

Another emergency stop push-button of the twist and release type shall be mounted in close and visible proximity to the pump motor for each motor.

All emergency stop circuits **must be wired failsafe**.

E2.1.1.6 JUNCTION BOXES

Cable junction boxes shall be provided for connecting the integral power cables of any equipment (such as immersible or submersible pump motors) to the MCC via standard 4C cables or integral instrument cables such as transmitters or switches to instrument individual or multicore cables.

It shall furthermore be permissible to group instruments in a close proximity of each other together and connect their cables up to the PLC via a local marshalling junction box.

The junction boxes shall be manufactured from strong, impact and corrosion resistant materials and shall be IP68 rated and include adequately sized cable glands and screw terminals for proper termination of the cables.

The junction boxes shall be mounted in such positions that they are easily maintainable and not subject to damage during mechanical maintenance.

All cable glands shall be in accordance with the standard specification and shall furthermore be IP68 rated “enviro” type glands.

The contractor shall allow for all glands and junction boxes required for the installation in the prices submitted at tender.

All junction boxes shall be Pratley, unless stainless steel or aluminium boxes prove to be best suited for the application

E2.1.1.7 CONTROL PHILOSOPHY OF THE BLOWER UNITS (MCC)

New double blower units shall be installed in the blower room to form a duty/standby arrangement, which shall flip flop for each pumping cycle. The blowers will provide the required air based on oxygen demand and the detailed starting philosophy will be as detailed in civil engineer's specification.

Modes of operation

Blower units shall operate in three modes of operation 'AUTO', 'MAN' & 'OFF' and shall be available via a 3-position selector switch on the control starter panel door.

With the selector switch selected in 'AUTO' the control shall be as follows:

The blowers will automatically flip flop starting and stopping according to the conditions stated for :

- Starting blower units
- Stop blower units

All logic shall be performed by contractors, relays and timers etc

All fault and alarm conditions will need to be reset manually from the pump station when selected in 'AUTO'.

With the selector switch selected in MAN' the control shall be as follows:

In the manual selected position, the pumps shall be started manually by means of separate start and stop push buttons for each pump.

Manual operation is not to be the normal mode of operation and is only to be used for testing and maintenance purposes, therefore the operation shall be manned at all times during such operation with skilled and trained operators.

With the selector switch selected in 'OFF' the control shall be as follows:

No control shall be possible and any previously running equipment shall stop.

Pump & Motor Protection

The following pump and motor protection shall be available in the operational modes indicated in the table below:

TYPE OF PROTECTION	**AUTO**	**MAN**	**OFF**
Short circuit & overcurrent protection	×	×	
Earth fault protection	×	×	
Over & under voltage	×	×	
Phase sequence & imbalance	×	×	
Motor high temp	×	×	
Under load Protection	×	×	
Vibration	×	×	

Any fault condition that occurs must be indicated on remote SCADA and by an illuminated indication light and prevent any further operation of the motor until the reset push button has been pressed. Only once the fault has been cleared and the reset button pressed should the indication light go off and normal operation allowed commencing. All protection and float control circuits **must be wired failsafe.**

E2.1.1.7 CONTROL PHILOSOPHY OF THE WATER TREATMENT MOTORS

A pump-set shall be installed in the equipment building for domestic water pump booster on duty/standby arrangement, these shall alternate and one duty pump shall run to fill water into the elevated tank if the water level is regarded as empty, shall stop when the tank is regard as full.

Modes of operation

The pumps shall operate in three modes of operation 'AUTO', 'MAN' & 'OFF' and shall be available via a 3-position selector switch on the control starter panel door.

With the selector switch selected in 'AUTO' the control shall be as follows:

The pumps will automatically flip flop, starting and stopping according to the start and stop conditions as stated above.

All fault and alarm conditions will need to be reset manually from the pump station when selected in 'AUTO'.

With the selector switch selected in MAN' the control shall be as follows:

In the manual selected position, the pumps shall be started manually by means of separate start and stop push buttons for each pump.

Manual operation is not to be the normal mode of operation and is only to be used for testing and maintenance purposes, therefore the operation shall be manned at all times during such operation with skilled and trained operators.

With the selector switch selected in 'OFF' the control shall be as follows:

No control shall be possible and any previously running equipment shall stop.

Pump & Motor Protection

The following pump and motor protection shall be available in the operational modes indicated in the table below:

TYPE OF PROTECTION	**AUTO**	**MAN**	**OFF**
Short circuit & overcurrent protection	×	×	
Over & under voltage	×	×	
Phase sequence & imbalance	×	×	
Low & high level (float switch)	×	×	
Motor high temp	×	×	
Phase angle / Under load Protection	×	×	

Any fault condition that occurs must be indicated by an illuminated indication light and prevent any further operation of the pump until the reset push button has been pressed. Only once the fault has been cleared and the reset button pressed should the indication light go off and normal operation allowed commencing. All protection and float control circuits **must be wired failsafe.**

E2.1.2 DE-COMMISSIONING OF THE EXISTING PANELS

The existing pump-set and electrical equipment in filtration room is to remain in service until the new MCC and pump-set has been installed and commissioned for a trouble-free period of at least 1 week. Only once a trouble-free period of 1 week has been reported to the Engineer shall permission be granted to the contractor to proceed with the de-commissioning and upgrading of the existing pump-set. Should this not be a viable solution a new plan shall be established and presented to engineer for approval. The newly established plan shall ensure that the Hospital has enough water all times.

E2.1.3 LIGHTNING PROTECTION

All equipment in the control MCC shall be adequately protected against lightning and lightning induced disturbances on the control and power cables. Suitable lightning suppressors, surge arrestors and circuit breakers shall be provided to suit the particular application.

E2.1.4 GENERAL ELECTRICAL REQUIREMENTS

The Contractor shall refurbish the general electrical installation on site including all small power outlets and luminaries as shown on the drawings.

E2.1.5 LOW VOLTAGE (L.V.) CABLES AND TRENCHES

Supply and install the following L.V. cables. The cables shall comply with the requirements of SANS 1507 as amended. The cables shall be of the PVC/PVC/SWA/PVC type.

Source	To	With
Existing Eskom kiosk	LV room	120mm² x 4core Cu SWA PVC armoured copper cable with 120mm² bare earth
Existing LV room	Water Treatment MCC	70mm² x 4core Cu SWA PVC armoured copper cable with 70mm² bare earth
Existing LV room	Blower room	25mm² x 4core Cu SWA PVC armoured copper cable with 25mm² bare earth
Water Treatment MCC	Fire Booster Motor	50mm² x 4core Cu SWA PVC armoured copper cable with 50mm² bare earth
Water Treatment MCC	WTW panel	25mm² x 4core Cu SWA PVC armoured copper cable with 25mm² bare earth

E2.1.6 IDENTIFICATION OF CABLES

Cables shall be identified at all terminations by means of punched metallic bands or marked with labels or tags. (Refer also to SANS 10142). The use of PVC tape with punched characters is not acceptable. The identification numbers of cables shall be shown on "as built" drawings of the Installation.

E2.1.7 TRENCHING

General

The Contractor shall be responsible for all trenching excavations unless specified to the contrary.

The Contractor shall, before trenching commences, familiarise himself with the routes and site conditions and the procedure and order of doing the work shall be planned in conjunction with the general construction programme for other services and building requirements.

The Contractor shall acquaint himself with the position of all the existing services such as stormwater pipes, water mains, sewer mains, gas pipes, telephone cables, etc. before any excavations are commenced. For this purpose, he shall approach this Department's representative, the local municipal authority and any other authority which may be involved, in writing.

The Contractor will be held responsible for damage to any existing services brought to his attention by the relevant authorities and shall be responsible for the cost of repairs.

The Contractor shall take all the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.

The Contractor shall ensure that the excavations will not endanger existing structures, roads, railways, other site constructions or other property.

Mechanical Excavators

Power driven 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 power-driven mechanical excavators shall be subject to the approval of the Department/Engineer. Should the excavator produce trenches that exceed the required dimensions, payment based on volumetric excavation rates will be calculated on the required dimensions only.
Routes

Trenches shall connect the points shown on the drawings in a straight line. Any deviations due to obstructions or existing services shall be approved by the Department/Engineer beforehand.

The Department/Engineer reserves the right to alter any cable route or portion thereof in advance of cable laying. Payment in respect of any additional or wasted work involved shall be at the documented rates.

The removal of obstructions along the cable routes shall be subject to the approval of the Department/Engineer.

Shoring and Waterlogging

The Contractor shall provide shoring for use in locations where there is a danger of the sides of the trench collapsing due to waterlogging or other ground conditions. Refer to the The Occupational Health and Safety Act.

The strength of shoring must be adequate for site conditions prevailing and the shoring must be braced across the trench.

The Contractor shall provide all pumps and equipment required to remove accumulated water from trenches. Water or any other liquid removed shall be disposed of without any nuisance or hazard.

Trenching

Trenching shall be programmed in advance and the approved programme shall not be departed from except with the consent of the Department/Engineer.

Trenches shall be as straight as possible and shall be excavated to the dimensions indicated in this specification.

The bottom of the trench shall be of smooth contour, and shall have no sharp dips or rises which may cause tensile forces in the cable during backfilling.

The excavated material shall be placed adjacent to each trench in such a manner as to prevent nuisance, interference or damage to adjacent drains, gateways, trenches, water furrows, other works, properties or traffic. Where this is not possible the excavated materials shall be removed from site and returned for backfilling on completion of cable laying.

Surplus material shall be removed from site and disposed of at the cost of the Contractor.

Trenches across roads, access ways or footpaths shall not be left open. If cables cannot be laid immediately the Contractor shall install temporary "bridges" or cover plates of sufficient strength to accommodate the traffic concerned.

In the event of damage to other services or structures during trenching operations the Contractor shall immediately notify the Department/Engineer and institute repairs.

Prior to cable laying the trench shall be inspected thoroughly and all objects likely to cause damage to the cables either during or after laying shall be removed.

Where ground conditions are likely to reduce maximum current carrying capacities of cables or where the cables are likely to be subjected to chemical or other damage or electrolytic action, the Department/Engineer shall be notified before installing the cables. The Department/Engineer will advise on the course of action to be taken.

Extreme care shall be taken not to disturb surveyor's pegs. These pegs shall not be covered with excavated material. If the surveyor's pegs are disturbed, they shall be replaced by a person qualified to do so.

Dimensions of trenches

Cable trenches for one or two cables shall not be less than 300 mm wide and need not be more than 450 mm wide. This dimension shall be valid for the total trench depth.

The width shall be increased where more cables are installed to allow for the spacings stipulated herein this specification.

Where trenches change direction or where cable slack is to be accommodated, the Contractor shall ensure that the requirements of the relevant SANS Specification regarding the bending radii of cables are met when determining trench widths.

Trench depths shall be determined in accordance with cable laying depths and bedding thickness.

Payment will be made on a volumetric excavation rate calculated on the basis of the given maximum dimensions or the actual dimensions, whichever is the lesser.

Joint Holes
Where cable joints are required to be made in the course of a cable run, a joint hole shall be excavated of sufficient size to enable the cable jointer to work efficiently and unimpeded.

Bedding

The bottom of the trench shall be filled across the full width with a 75mm layer of suitable soil sifted through a 6mm mesh and levelled off.

Only sandy clay or loam soil with a satisfactory thermal resistivity (not exceeding 1,5°C m/W) may be used for this purpose. Sea or river sand, ash, chalk, peat, clinker or clayey soil shall not be used. The use of crusher sand is acceptable.

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 cost of importing soil for bedding purposes shall be included in the unit rates for excavations.

After cable laying a further layer of bedding shall be provided to extend to 75 mm above the cables.

The bedding under joints shall be fully consolidated to prevent subsequent settling.

Cable Sleeves

Where cables cross under roads, railway tracks, other service areas, etc. and where cables enter buildings, the cables shall be installed in Polyethylene (6mm thickness), asbestos cement pipes or earthenware pipes. Pitch fibre and PVC pipes are not acceptable because of the adhesion that occurs after a period of time between the pipe and the sheathing or outer serving of the cables.

Pipes shall be joined in accordance with the manufacturer's instructions.

Sleeves shall cross roads and railway tracks at right angles.

Sleeves shall have a minimum diameter of 100mm. They shall extend at least 2m beyond the tracks of a railway line or of the outermost tracks where there is more than one line. In the case of roads, the sleeves shall extend at least 1m beyond the road edge or kerb on both sides of the road.

All sleeves shall be graded 1:400 for water drainage.

Cable sleeves shall be installed to the spacings and depths stated herein.

Galvanised metallic sleeves up to and including 76mm dia. shall be supplied and installed by the contractor.

The ends of all sleeves shall be sealed with a non-hardening watertight compound after the installation of cables. All sleeves intended for future use shall likewise be sealed.

Backfilling

The Contractor shall not commence with the backfilling of trenches without prior notification to the Department/Engineer so that the cable installation may be inspected. Should the Contractor fail to give a timeous notification, the trenches shall be re-opened at the Contractor's cost. Such an inspection will not be unreasonably delayed.

For high voltage cables (1 kV to 11 kV) a coloured plastic marking tape shall be installed 400 mm above the cable. The tape shall be yellow, marked with the words "ELECTRIC CABLE/ELEKTRIESE KABEL" in red. These markings shall not be more than 1m apart from centre to centre.

Backfilling shall be undertaken with soil suitable to ensure settling without voids. The maximum allowable diameter of stones presents in the backfill material, is 75mm.

The Contractor shall have allowed in his tender for the importation of suitable backfill material if required.

The backfill shall be compacted in layers of 150mm and sufficient allowance shall be made for final settlement. The Contractor shall maintain the refilled trench at his expense for the duration of the contract. Surplus material shall be removed from site and suitably disposed of.

On completion, the surface shall be made good to match the surrounding area.

In the case of roadways or paved areas the excavations shall be consolidated to the original density of the surrounding material and the surface finish reinstated.

Cable Markers (for HV cables only, except where otherwise specified)

Cable markers shall be provided along all HV cable routes but need only be provided along LV cable routes where specified.

Cable markers shall consist of concrete blocks in the shape of truncated pyramids, approx. 300mm high, 150 x 150mm at the top and 250 x 250mm at the bottom.

Brass plates shall be cast into the tops of the blocks in such a manner that they cannot be prised loose. The wording "ELECTRIC CABLE/ELEKTRIESE KABEL" shall be stamped on the brass plates as well as direction arrows and the cable voltage rating.

Cable markers shall be installed on the surface along all the underground routes and shall project 35 mm above normal ground level unless the projected markers could be a hazard to pedestrian or other traffic in which case they shall be installed flush with the surface.

Cable markers shall be installed at the beginning and end of a cable run (e.g. where a cable enters a substation or building), at all changes of direction, above all joints, above cable pipe entries and exits and at intervals not exceeding 50 m along the cable route.

The position of cable markers shall be indicated on the "as built" drawings.

RAILWAY or Road Crossings

The Contractor shall not trench beneath any railway tracks without the TRANSNET Administration's supervision. The Contractor shall request the Department/Engineer timeously to arrange for the necessary supervision. The cost of such supervision will be paid for by the Department.

The Department/Engineer will arrange for the necessary wayleave and permission to cross TRANSNET property and railway tracks, or Provincial or National road reserves and TELKOM Authority approval of proposed cable routes.

The Contractor shall carry out the crossing installation in strict accordance with the TRANSNET and Provincial Administration's requirements and stipulations. Where these requirements are in contradiction with this specification, the Department/Engineer's ruling shall be sought.

The Contractor shall ensure that he will comply with the various Administration's requirements regarding crossing of Provincial and National roads, especially with regard to the safeguarding of the public. The Contractor shall also provide proof of adequate insurance cover against any claim from any accident as a result of work done by the Contractor during the crossing operation. The Department/Engineer shall also be indemnified from all liability in this regard.

The Contractor shall liaise with the various Administrations well in advance regarding the intended dates, times and expected duration of the crossing operations and obtain their approval of the programme and method of operation before commencing with the work.

E2.1.8 INSTALLATION OF UNDERGROUND CABLES

Installation Depths

Cables shall be installed at the following minimum depths below final ground level:

Up to 11kV : 600mm

All cable depth measurements shall be made to the top of the cable when laid directly in ground or to the top of the duct or sleeve where these are provided.

The above depths shall apply to the top layer where cables are installed in layers.

The Contractor may only deviate from the above depths provided prior authority in writing has been obtained from the Department/Engineer. In this event the cables shall be protected with a suitable concrete covering.

The depth of cable pipes or ducts beneath railway lines or roads shall be not less than 1,1 m below the formation level.

Cable Spacings

Cables installed in the same trench shall be laid parallel to each other with the following spacings between cables (LV: up to 1 kV; HV: 1 kV to 11 kV):

LV/LV : 2 cable diameters

LV/HV	:	150mm minimum
HV/HV	:	150mm minimum
LV/HV/PILOT	:	1 cable diameter

Where HV and LV cables have to be installed in the same trench, both shall be laid at a depth of 800 mm and then covered with 200mm of soil. The soil shall then be compacted, and then backfilled layer by layer and compacted until the trench is completely backfilled.

Cables for telephones, communication systems and other low voltage systems (less than 50 V) shall be separated from power cables by at least 1m. All control or pilot cables without a lead sheath and steel armouring shall be laid at least 300mm from power cables.

Cables shall not be buried on top of each other unless layers are specified. The minimum spacing between layers shall be 200mm.

Cable Laying

Except where ducts, tunnels or pipes are provided, cables shall be laid directly in the ground.

The cable shall be removed from the drum in such a manner that the cable is not subjected to twisting or tension exceeding that stipulated by the cable manufacturer.

Cable rollers shall have no sharp projecting parts liable to damage the cables.

Where cables have to be drawn around corners, well-lubricated skid plates shall be used. The skid plates shall be securely fixed between Cable rollers shall be used as far as possible to run out cables. Rollers shall be spaced so that the length of cable in the trench will be totally suspended during the laying operation and sufficiently close to prevent undue sagging and the cable from touching the ground. Rollers shall also be placed in the trench in such a manner that they will not readily capsize.
rollers and shall constantly be examined during cable laying operations.Where cables have to be drawn through pipes or ducts, a suitable cable sock shall be used and particular care shall be exercised to avoid abrasion, elongation or distortion of any kind. In the case of oil filled cables, a cable sock may never be used. Special eyes giving access to the interior of the cable, must be utilised.

The maximum allowable tension when pulling a cable, is 70 N/mm² of conductor area.

It will be assumed that the price or rates contained in the tender includes for the installation of cables in pipes and ducts or below existing or newly installed services.

The Department/Engineer shall be informed timeously of the intention to carry out all cable laying operations to allow an inspection of the works by the Department/Engineer if so required.

E2.1.9 INSTALLATION OF CABLES IN CONCRETE TRENCHES

General

This paragraph covers the installation of cables in building trenches, service ducts, etc. The trenches, ducts, etc. inside buildings will be constructed and installed by others.

Installation

Cables shall be installed in one of the following ways:

(a) On horizontal cable trays.

(b) On horizontal metal supports with suitable clamps.

(c) On vertical cable trays or metal. supports fixed to the side of the trench. The cables shall be clamped in position.

Cables shall not be bunched and laid on the floor of the building trenches.

Covers

The covering of concrete trenches shall as a rule fall outside the scope of the electrical installation. The Contractor shall however be responsible for the cutting or drilling and smoothing of holes for cables through chequer plates, concrete or other coverings as required.

Cables shall enter and exit the trench through sleeves protruding 300mm beyond the covering. The sleeves shall be permanently secured in position and the open space between the cable and sleeves shall be sealed with a non-hardening, watertight compound.

Filled trenches

Where specified, floor trenches shall be filled with fine crusher sand (no river or see sand).

If a sand filling is specified, the cables shall be fixed to non-corroding supports.

Sand-filled trenches other than in substations shall be covered in one of the following ways:

(a) Reinforced concrete covers.

(b) Sand and cement screed.

(d) Removable chequer plates.

Method (a) above shall be used where vehicular traffic may be encountered over trenches. Unless otherwise specified allowance for a mass of 2 tons shall be made.

Cable trenches in substations, switch rooms and generator rooms shall be covered in accordance with the specification.

E2.1.10 FIXING OF CABLES TO TRAYS OR STRUCTURES

Installation

Cables may be installed in one of the following ways:

- On horizontal cable trays.
- Against vertical cable trays with suitable clamps.
- Against horizontal or vertical metal supports or brackets with suitable clamps.
- On clamps which are fixed to the structure.

Clamps

Suitable clamps (cleats) which will secure cables without damage shall be used. Metal clamps or drilled hard wood blocks shall be used. Clamps shall consist of adjustable metal wings which clamp to a metal support, or consist of two halves that are bolted together. The correct clamp size to fit the cable shall be used. Cables of different sizes may only be fixed by a common clamp when the clamp is specially made to accommodate the various cables.

E2.1.11 GROUPING AND SPACING OF CABLES IN BUILDINGS AND STRUCTURES

Spacing correction factors

Cables shall as a rule be spaced two cable diameters apart, for which no grouping correction factor need be applied.

Cables on Different Levels

Where parallel cable runs are installed at different levels (e.g. on parallel cable trays) and where the spacing of the layers is not specified, a minimum spacing of 300mm shall be maintained.

Single Core Cables

Where single core cables are installed along a three-phase circuit, the cables shall be installed in trefoil formation and bound together at 300mm intervals.

High Voltage Cables

High voltage cables shall be separated from other cables and services throughout the installation and shall as far as possible be installed in separate floor trenches, pipes or metal channels. Where this is not feasible a minimum spacing of 500 mm shall be maintained.

Cables for Other Services

Cables for telephones, communication systems and other low voltage systems (less than 50 V) shall be separated from power cables. In building ducts a physical barrier shall be provided between power cables and cables for other services. Where armoured cables are used for such other services, they shall be installed on separate cable trays or shall otherwise be at least 1m away from power cables. Where unarmoured cables are used for these other services, they shall be installed in separate conduits or metal channels.

E2.1.12 TERMINATION AND JOINTING OF CABLES

General

Cable ends shall be terminated with glands or in cable boxes with the associated accessories such as clamps, shrouds, etc. complying in all respects with the specification.

Connection of cables to switchgear shall always be effected in such a way that the various phases, seen from the front of the switchgear will be in the following positions:

- No. 1 conductor : left (red) (A)
- No. 2 conductor : centre (white) (B)
- No. 3 conductor : right (blue) (C)

Exposed armouring shall be covered with bitumen-base paint.

All cable ends shall be supplied with the necessary earth connection.

A channel or other approved means of support shall be provided to remove mechanical stress from the glands. Cable cores shall be marked with heat-shrunk sleeves where necessary to identify the phases. Refer to SANS 10142.The current-carrying capacity and breakdown voltage of the cable end shall be the same as for the complete cable.

Termination of PVC-insulated Cables

Cable ends shall be terminated by means of adjustable glands and the glands shall be fitted in accordance with the cable and gland manufacturer’s instructions.

The correct size and type of gland shall be used for the particular cable and application.

Connection of Cable Conductors

Suitable lugs shall be used, preferably solidly sweated to the cable conductor ends. Lugs may be crimped, using mechanical or pneumatic tools designed for this purpose, on condition that evidence is submitted that

the method used complies with the performance requirements of BS 4579, Part 1 : "COMPRESSION JOINTS IN COPPER".

Contact surfaces shall be thoroughly cleaned and smoothed and fixing bolts shall match the hole size of the lug.

Cables that are connected to clamp type terminals where the clamping screws are not in direct contact with the conductor, need not be lugged but the correct terminal size shall be used.

Ferrules shall be used as far as possible where cable conductors are connected directly to equipment with screws against the conductor strands.

When cutting away insulation from cable conductors to fit into lugs, care shall be taken that no strands are left exposed. Under no circumstances may any of the conductor strands be cut away to fit into lugs.

Joints

Joints in cable runs will not be allowed unless specified in the Detail Technical Specification or authorised by the Department/Engineer.

Jointing shall be carried out strictly in accordance with the manufacturer's instructions and by personnel competent in jointing the types of cables used.

During outdoor jointing operations, the joint bays shall be adequately covered by tents of waterproof material suitably supported. Where necessary a trench shall be excavated around the bay to prevent the ingress of moisture. The sides of the hole shall be draped with small tarpaulin or plastic sheeting to prevent loose earth from falling in during jointing operations.

The joint shall not impair the anti-electrolysis characteristics of the cable.

The Contractor shall notify the Department/Engineer timeously of the day on which jointing is to be carried out in order than an inspection may be arranged if so required. Any cable joint not inspected by the Department/Engineer because of insufficient notice being given, shall be opened for inspection and redone at the discretion of the Department/Engineer at the cost of the contractor.

LV cable joints shall be of the epoxy-resin type. Joints shall be fully water and air tight and shall be free of voids and air pockets.

The crossing of cores in joints will not be permitted under any circumstances.

E2.1.13 TESTING

Each cable shall be tested after installation in accordance SANS 1507 (up to 1 kV) and SANS 97 (up to 11 kV) as well as the requirements of the Local and Supply Authorities.

LV Cables shall be tested by means of a suitable megger at 1 kV and the insulation resistance shall be tabulated and certified.

The Contractor shall make all arrangements, pay all fees and provide all equipment for these tests. The cost of testing shall have been included in the tender price.

The Contractor shall notify the Department/Engineer timeously so that a representative of the Department may witness the tests.

On completion of the tests on any cable, the Contractor shall without delay, submit three copies of the certified Test Reports to the Department/Engineer.

E2.1.14 MEASUREMENT AND PAYMENT

PRINCIPLES

The rate for laying a cable shall cover the cost of handling, placing, compacting the bedding materials up to the underside of the mainfill, in addition to any other cost associated with laying the cables.

SCHEDULED ITEMS

Take delivery of, lay and bed cables.....Unit: m

Cables will be measured as the gross length of trench excavated and approved by the Engineer plus 1,0 metre at terminal equipment and the actual measurement within a substation building.

Separate items will be scheduled for each size and type of cable specified. The rates shall cover the labour cost of taking delivery of the cable, inspecting, bedding and laying of the cables including the testing thereof

LV cable jointing.....Unit: No

Joints will be measured as complete units.

Separate items will be scheduled for each type and size of cable joints.

The rate shall cover the cost of taking delivery of the jointing material, inspecting the cable and all labour necessary for the making of each joint.

LV cable terminations.....Unit: No

Terminations will be measured as one unit per cable and not per conductor end.

Separate items will be scheduled for each type and size of cable termination. The rate shall cover the cost of taking delivery of the termination material, inspecting the cable and all labour necessary for the making of each termination.

E2.1.15 NEW LUMINAIRES

All existing luminaries in the pump stations and coagulation room shall be replaced with new LED fittings and the following fittings shall be installed as shown on the design drawings:

Type	Description/Specification	Typical Fitting
TYPE A	Surface mount 40W LED luminaire with 4000lm and dimensions of (LxWxH) 1270 x 86 x 90 mm shall consists of an injection-moulded, flame-retardant polycarbonate housing and prismatic diffuser. A powder coated white reflector and control gear tray upon which all electrical components shall be mounted and secured by means of multiple twist lock latches to secure the reflector to the housing. Silicon sponge seal shall be moulded into the housing to ensure an optimal seal between the housing and the prismatic diffuser. Two of the stainless-steel latches shall facilitate the hinging of the diffuser and ensure correct alignment when closing the diffuser. It shall be designed to operate LEDs of up to 65W.The luminaire shall come complete with constant current driver,1.7 to 2.3kg weight, mains tolerance of ± 10% at 230V voltage supply, line frequency of 50Hz, Class I electrical safety class, 10kV/10kA surge protection, power factor of ≥ 0.95, operating temperature of -30 to +35°C, enclosure tightness of IP 65 and mechanical withstand impact of IK07.	

TYPE B	Surface mount 13W LED luminaire with 2000lm and dimensions of 280mm diameter shall have base and trim ring manufactured from of high pressure die-cast marine grade, the trim ring casting shall be mounted onto the base casting by means of stainless steel M5 Allen head screws located outside the lamp compartment. The base and trim shall be finished with epoxy powder coating. An opal non-discolouring high impact acrylic injection molded diffuser shall be used and shall offer excellent vandal resistance, be highly translucent and shall not discolour even when subjected to the harshest UV environments. A silicon sponge gasket shall be fitted into a special groove in the diffuser to prevent damage to the gasket during installation and to achieve the certified ingress protection rating of IP65, It shall be designed to operate LEDs of up to 13W.The luminaire shall come complete with 300mm supply lead, constant current driver, mains tolerance of ± 10% at 230V voltage supply, line frequency of 50Hz, Class I electrical safety class, 10kV/10kA surge protection, power factor of ≥ 0.95, operating temperature of -20 to +35˚C, and mechanical withstand impact of IK08.	
TYPE C	Surface mount 17W LED luminaire with 2600lm and dimensions of 274mm per side, shall have base and trim ring manufactured from of high pressure die-cast marine grade, the trim ring casting shall be mounted onto the base casting by means of stainless steel M5 Allen head screws located outside the lamp compartment. The base and trim shall be finished with epoxy powder coating. An opal non-discolouring high impact acrylic injection molded diffuser shall be used and shall offer excellent vandal resistance, be highly translucent and shall not discolour even when subjected to the harshest UV environments. A silicon sponge gasket shall be fitted into a special groove in the diffuser to prevent damage to the gasket during installation and to achieve the certified ingress protection rating of IP65, It shall be designed to operate LEDs of up to 17W.The luminaire shall come complete with 300mm supply lead, constant current driver, mains tolerance of ± 10% at 230V voltage supply, line frequency of 50Hz, Class I electrical safety class, 10kV/10kA surge protection, power factor of ≥ 0.95, operating temperature of -20 to +35˚C, and mechanical withstand impact of IK08.	

TYPE D	Wall mount (flood mounting) 55W 24LED luminaire with 7012lm and dimensions of (LxWxH) 3396mm x 249mm x 63mm shall have body manufactured from marine grade aluminium, high-impact polycarbonate protector and painted finish, housing shall be corrosion-resistant high-pressure die-cast and shall provide access to photometric engine and electronic assembly in case of upgrading or replacing components. The luminaire shall have certified ingress protection rating of IP66, It shall be designed to operate LEDs of up to 55W.The luminaire shall come complete with constant current driver, mains tolerance of ± 10% at 230V voltage supply, line frequency of 50Hz, Class I electrical safety class, 10kV/10kA surge protection, power factor of ≥ 0.95, operating temperature of -20 to +60°C, and mechanical withstand impact of IK10.	

E2.1.16 CONDUIT AND WIRING

Galvanised plain-end steel conduit shall be used for lighting and power installation, all conduit shall be chased into wall unless an agreement between the engineer and contractor has been reach to have it surface. All wiring shall be channelled through conduit throughout the installation and 2.5mm^2 single core stranded conductor shall be used for lighting and 4mm^2 shall be used for single phase socket-outlet points unless. Provisional quantities of conduit, wiring and small power outlets have been included in the bills of quantities. Instructions as to the final requirements will be issued during the construction stage. All items will be re-measurable.

E2.1.17 TELEMETRY

The Contractor will be responsible for the supply, installation and commissioning of a new telemetry system. The Telemetry units will be wall mounted on enclosures manufactured from 3CR12, with baked enamel finish. All Telemetry radios are to operate on the 433.05 - 434.79Mhz licence free bandwidth. All telemetry shall be 12 VDC operated with battery backup. A minimum standby time of 24 hours is required.

Coordinates for Telemetry Stations

Raw Water Pump Station

Latitude 32°25'21.70"S
Longitude 28°29'12.97"E

Blower Room

Latitude 32°25'48.39"S
Longitude 28°28'32.61"E

SCADA Room

Latitude 32°25'48.49"S
Longitude 28°28'27.08

E2.1.17.1 TELEMETRY EQUIPMENT

System Overview

The telemetry system supplied will be used for remote monitoring and control to various designated sites.

The system shall not only allow for units that accept direct I/O (e.g. digital, analogue, pulses) but also gateway units that allow direct interfacing to common industrial protocols (e.g. Modbus, Modbus Plus, Ethernet/IP, Profibus, DF1) commonly employed by various PLC vendors as well as third party equipment manufacturers.

It shall therefore be possible to have a combination of both wireless I/O and wireless gateways in a single telemetry system that can scale as the system requirements dictates. The system aims for easy setup and maintenance (by the supplier as well as end-user if necessary). The software to configure and maintain the radios shall be made freely available with this system.

It is strongly advised that radio path testing is undertaken where uncertainty lies on the reliability of the radio signal strength. The radio telemetry system shall operate in the 430 – 450MHz range with a software-adjustable RF transmit power level of up to 5W.

Principle of Operation

Radio transmissions must occur when an input signal changes (change-of-state). That is, when a digital (e.g. switch contact) input turns off or on, or when the value of an analogue input changes by a pre-configured amount (delta-change), a radio transmission should occur. There should also be regular update transmissions (configurable) to check the value of the input signals and to insure the integrity of the communications signal. The communications status shall be made available as an alarm output. In the event of a communications failure, it shall be possible to reset digital and analogue outputs to zero.

Input signals should be transmitted in a data frame which shall include the address of the transmitting module (and repeaters if used), the address of the destination module, and a CRC error check. The error check will be used to ensure that there is no corruption of the data frame during transmission. The same radio module shall have digipeating (digital repeating) capabilities as well. It shall also be possible to have peer-to-peer communications between modules – this means that wireless units can transmit directly to any other wireless unit, and can also transmit to multiple wireless units. There are no master units and no slaves and it shall be possible for all input signals to be transmitted to multiple destinations.

Each module should have handshaking capabilities over the air so that if transmitting module is supposed to receive an acknowledgment from the receiving module, and the transmitting module does not receive this acknowledgment, it should have retry capabilities. It must be possible to flag a communications failure via a digital output on the unit.

General Specifications

Power Supply:

The unit should incorporate an internal switched-mode power supply design that will accept an input voltage of 230V +-10% tolerance supply. The unit should also have a built-in battery charger to allow for an uninterrupted power supply and internally automatically switch to 12V battery backup in the event of a power failure. On return of main supply, the unit must switch back to mains operation, and charge the battery. It must also be possible to power the unit directly from a 12V battery at the battery terminals. The unit should have the ability to communicate its current state in real time to the RTU, giving the operator the ability to monitor and log voltages and currents as well as battery and AC state. The radios power circuit must have built-in intelligence and should be able to automatically alarm on loss of mains supply, loss of solar charging or low battery voltage and it should be possible to transmit these alarm signals to remote modules as digital output signals.

Inputs / Outputs Description:
See the technical specifications table below to a description of the I/O capabilities of the radio modules.

RS232 Port:

The serial port must be a 9 pin DB9 female and should provide a connection to a terminal or to a PC for configuration and testing. The port should not be used for radio data communications except in the case of wireless gateways where it could be used for interfacing to a host device such as a PLC.

RS485 Port:

All telemetry modules will have I/O expansion capability via the RS485 port in the event that outstations I/O count needs to be expanded. The units must be expandable with up to 31 remote I/O units on the RS485 bus and mounting distances of up to 1200m from the radio should be achievable. The expansion I/O should consist of several options that include Digital, Analogue and Pulse input / output variations.

Software Configuration:

The units should be easy to configure via standard Windows-based software. Programming the units can be done via a straight serial cable to the RS232 serial port. It must also be possible to extract the software configuration from the module. The configuration software should be project-based and a single project file shall be used for the complete telemetry installation. There shall be password protection facilities for the project file to prevent unauthorized use. There software shall log and store data as required by the client for future use or reference.

Diagnostics and Testing:

The unit should provide diagnostic and test functions by connecting a PC terminal to the module. It should be possible to test both I/O and communication functions. The unit will include a radio strength measurement, which provides an indication of background noise as well as received radio strength. This feature shall allow radio paths to be tested without any additional specialized test equipment. In the case of wireless Gateways, it should be possible to read and write to the actual units data registers for testing and diagnostic purposes.

Summary of Minimal Technical Specifications for Radio Telemetry Equipment.

Remote Terminal Unit

Item	**Minimum Specification**
Communication	Data Radios, Cell SMS, Cell GPRS, RS232/485 and Ethernet etc
Features	Real-time I/O device, Intelligent Data Logger, Remote time stamping of event and logged data, Configurable and programmable from the Picasso Configuration Toolbox, modular and easily expandable, EMI Protection, Programmable with PLC Languages, Industrial standard high speed processor, On-Board 1Meg-Word Flash and Gig-Word non volatile RAM, On-Board Real-time clock and watch-dog timer , On-Board LED's indicating the Digital Input and Digital Output Status , Communication Orchestrator, Build to ISO 9000 Standards, 24 I/O's on the main processor board, DIN,8 AIN,8DOT,connects to interface modules such as I/O lightning protection units, galvanic isolation units for AIN's and 10A Interposing relay modules.
Analog Inputs (AIN)	8 Inputs, 12 Bit Resolution, 0.1 % Accuracy, Single ended, Additional AIN on expansion modules,
Digital Inputs (DIN)	8 Inputs, with LED status display, Opto-Isolated, 5 kV isolation and Additional DIN on expansion modules to accommodate all I/Os
Digital Outputs (DOT)	8 Outputs with LED status display, Open Collector, 250mA sinking per channel and additional DOT on expansion modules

Other Specifications	Voltage: 9 to 17Volts DC,120mA power consumption,2 x RS232 ports (300 to 57600 bps) RJ45(EIA-561 Compatible)
Data Reporting	Data shall be capable of being reported to any SCADA on the communication network. It shall be capable of being configured to send text messages to mobile cell phone users to report alarms

Digital Input Surge Protector

Item	**Minimum Specification**
Features	Digital input lightning protection, No isolation available on the module.
Supply Voltage DC	Minimum 9V, maximum 15V and standard 12V
Physical Dimension	61mm x 42mm x 80mm (LxWxH)
Connection Sockets	14-Way Ribbon to the RTU or I/O Modules, 2 x 8 way termination connectors, 4 Way Power Supply 12V+, Ground.
Protection	10kA per channel and maximum input voltage 30Vdc
Channel (I/O)	Four channels

Power Supply

Item	**Minimum Specification**
DC supply	13.8V (tunable), max 4.3A (split between DC output and battery charge)
AC supply	Input: 90~264VAC, 47~63Hz
Battery supply	Battery charge: max 1.5A
Battery	Low Maintenance Battery 12Volt 18Ah
Rated Power	60W
Protection	Short circuit, overload and over-voltage protection, Battery low, battery polarity protection

Data Radio

Item	Minimum Specification
Transmission Power	2W
Working Frequency	433MHz, options 402-470MHz
Power Consumption	DC5V Power, receiving current <50mA, transmitting current <1.5A/2W (<1A/1W); Sleeping current ＜1mA.
Receiver Sensitivity	-112dBm
Working Temperature	-40℃~+85℃
Output/ Input Interface	RS 232, RS 485 and TTL
Power control	One sleeping model, awaken from hardware
Circuit Structure	Radio adopts chip integration, the conversion time for transceiver should be short less than 20ms, all indications consistency and better performance
High Anti-Interference and Low BER (Bit error Rate)	Based on the GFSK modulation mode, it shall adopts the efficient communication protocol. The actual bit error rate shall be 10-5～10-6 when channel bit error rate is 10-2.

Technical Competency

The supplier of the telemetry system must have experience with the radios being supplied and should either have undergone basic training or provide an authorized letter from the local agency indicating that they are able to offer sufficient technical support on the telemetry system.

Service and Maintenance

The type of telemetry system deployed should ensure that in the event of the end user not getting satisfactory service from the supplier, they are able to seek assistance and technical support from an alternate supplier. The radio configuration software and all future revisions of it should be freely available to the end-user.

Warranty

The radio telemetry modules used must ensure long-term reliable operation. A limited lifetime warranty from the manufacturer should be included as standard on all radio telemetry modules supplied.

E2.1.19 SCADA (SUPERVISORY CONTROL AND DATA ACQUISITION) SYSTEM

SCADA system shall provide supervisory control, monitoring and management of waste water system, raw water and portable water stations by acquiring and analysing the data from these remote stations. It shall gather the real-time data from the stations, presents the data on various HMIs, records and logs the data on SCADA database management.

Radio telemetry shall gather data from other stations to the main station and the data shall be transferred from main station to the SCADA system via fibre, however the system shall be capable of gathering data from any other station during communication breakdown.

The system shall be so designed to allow addition of future stations which shall be added and form part of the entire system at later stage.

SCADA system shall store received data which shall also be used for trending, alarming, reporting and archiving, this system shall be capable of sending an alarm via sms to the relevant stakeholders in the event of unattended alarm.

The supply and installation of the system shall come complete with the software, ADSL, correctly sized computer to cater for current installation and wastewater stations which shall be added at a later stage and any other accessories which are required to supply a complete operational system.

The system shall have as a minimum, an operating system of 64-bit windows 8.1 Professional, i7 processor, 8 GB RAM and 40inch commercial type computer screen.

E2.2 ELECTRICAL GENERAL TECHNICAL SPECIFICATION

E2.2.1 SCOPE OF WORK

The Contract Works include the supply, delivery, installation, testing, commissioning handing over in proper working order of the complete services installation as described in all the constituent parts of this document.

The Contractor will be responsible to repair all other existing equipment damaged by him or his employees at his own cost. He shall therefore familiarize himself with the positions of all other equipment before he commences.

E2.2.3 ELECTRICITY SUPPLY

Electricity supply will be made available by the Supply Authority at the voltage specified in the Project Specification, and the Contractor shall then deliver the installation in such a manner that it complies with the Supply Authority's requirements regarding voltage, current and frequency and with any other requirements which may be imposed by the Supply Authority. The Contractor must arrange in good time with the Supply Authority for the electrical supply connection, this shall including among other things making application, following up, completing forms or facilitating the completion thereof as it may be required and paying of connection charges.

E2.2.4 GENERAL

E2.2.4.1 STANDARD TECHNICAL SPECIFICATION

This Standard Technical Specification specifies the standard of workmanship and quality of material for the services installation further described in the Project Specification, the Drawings and Schedules, and if applicable, in the Schedules of Quantities.

This Standard Specification must be read in conjunction with the Project Specification, which qualifies and amplifies this Standard Specification. In the event of conflict, the Project Specification shall take precedence over this Standard Specification.

E2.2.4.2 TENDER DOCUMENTS

Upon receiving a tender document, Tenderers shall ensure that all pages and drawings are included. Should any page or drawing be missing, any doubt or obscurity arise about the meaning of any section of any part of the set of documents, or should any obvious error be apparent, Tenderers shall immediately inform the Engineer for amendment or clarification. Where a Tenderer's entry in a schedule conflicts with the document prepared by the Engineer, the Tenderer shall comply with the document prepared by the Engineer and the conflicting entry shall be invalid.

The main tender shall in all aspects comply with the tender document, however, alternative offers may be made with adequate qualifications of deviations from the Engineer's document. If a main tender is not submitted, any alternative offer will be deemed invalid.

All information and prices shall be submitted with the tender. No price negotiations will be entered into after submission of a tender.

Where this tender document is written in the form of instructions, such instructions are addressed to the Contractor.

E2.2.4.3 COMPLIANCE WITH REGULATIONS AND STANDARDS

The electrical installation shall comply with the latest revisions and amendments of the following:

The South African Bureau of Standards Code of Practice for the Wiring of Premises, SANS 10142-1:2017 Part 1, referred to herein as the "Wiring Code". The Contractor has to operate strictly in accordance with the Occupational Health and Safety Act and Regulations (Act No 85 of 1993) in its entirety and it is expected of him to:

Ensure the safe operation and safety of all people on site and to strive for a proper management and clean and safe site. Register himself and Sub-Contractors in terms of the Compensation for Occupational Injuries and Diseases Act (Act No 130 of 1993) and to issue a copy thereof to the Employer.

The Employer, his employees or any of his agents do not accept any responsibility and/or liability of any kind in terms of the clauses and/of prescriptions of the Occupational Health and Safety Act for the Works or any part thereof.

If the Employer or the Engineer or their representatives stop the work because it is unsafe in their opinion, the Contractor shall not have the right to any claims in this regard.

The Contractor is fully responsible and/or liable for any act and/or action of his employees and/or equipment that operate or that are used on site. The Contractor shall liaise with the Employer if he should, for whatever reason, be unable to perform in terms of the stipulations of the said Act.

The Contractor has to appoint in writing a capable person as required by the Occupational Health and Safety Act (Act No 85 of 1993 General Safety Regulation 11.1), and a copy of such an appointment has to be delivered to the Employer. This appointed capable person has to accept the appointment in writing and it has to be clearly indicated in his letter of appointment.

The Contractor shall annually register with the Electrical Contracting Board of South Africa as required by the Occupational Health and Safety Act 85/1993.

The Municipal By-laws and Regulations and any regulations of the Supplier of Electricity.

The Local Fire Office Regulations.

Regulations of Telkom.

The relevant codes and specifications as defined under Clause 3.3.16.

The regulations of the local gas supplier where applicable.

The standard Regulations of any Government Department or other statutory body where applicable.

No claims for extras arising from failure of the Contractor to comply with any of the regulations and standards listed above will be considered.

Where conflict appears to exist between any of the regulations and standards listed above and the specification, refer such conflict to the Engineer in writing for his ruling.

Immediately after receipt of official appointment as Contractor, and at any time thereafter as may be necessary, the Contractor shall notify all relevant authorities, pay fees and take any other steps which may be required or prescribed to execute the
contract works. The Contractor shall copy related correspondence to the Engineer who shall be kept informed at all times. This shall not, however, release the Contractor of his responsibilities.

Provide, in both official languages, notices and warning signs required by statutory or regulatory requirements.

E2.2.4.4 INSPECTION, TESTS AND COMMISSIONING

On completion of erection and installation on site the Contractor shall perform all the tests that may be required by the Engineer in his presence to ensure that the Works are ready for handing over and putting into regular use.

Near completion, inspect and test the services installation in accordance with the Wiring Code, the Regulations of the Supplier of Electricity and the Occupational Health and Safety Act 85/1993. Record test results on printed test sheets and submit to the Engineer.

Testing of the electrical installation shall be in accordance with the Project Specification, but shall include but not limited to the following:

Ensure correct polarity, phase rotation and balance load between the phases. Verify polarity and phase identification.

- Continuity and resistance of earth conductor including all bonding conductors.
- Continuity of ring circuit.
- Earth electrode resistance.
- Insulating resistance.
- Earth fault loop impedance test.
- Operation of earth leakage protection devices and circuit breakers.

After inspection and testing, timeously arrange for any inspection and test by the Supplier of Electricity if required, and assist as necessary the Inspector of the Supplier of Electricity by providing access, tools, instruments and attendance.

Replace any portion of the electrical installation that does not comply with the Wiring Code or the Specification. Such replacement shall be done at the Contractor's expense.

Submit a "Certificate of Compliance by an accredited person" Annexure 1 in terms of the Occupational Health and Safety Act 85/1993, Electrical Installation Regulation 1992, to the Employer and forward a copy to the Engineer.

Carry out additional special tests as required by the Engineer and provide the required test equipment.

Timely advise the Engineer of all inspections and tests as the Engineer reserves the right to witness such inspections and tests.

Provide access, tools, instruments and attendance, to assist the Engineer who may perform verification tests at any time.

The Engineer shall have the power at any time to examine any part of the Works or materials intended for use in or on the Works either on site, or at the place of manufacture or storage.

On completion of the works, the Contractor shall submit four indexed volumes of all test certificates to the Engineer for tests done at factories and on site. (To be included in the manuals).

The Contractor shall be responsible to calculate all relay settings. The settings shall be submitted to the Engineer for approval at least 2 weeks before the commissioning of the works commences. The settings shall be substantiated by calculation sheets and graphs where applicable.

The Contractor shall check that all protection relays and overload devices are properly set to protect equipment such as motors, cables and capacitors etc., before the system is energised or any motors are switched on. Where overload devices are overrated or the ranges of relays insufficient to protect equipment, the Engineer shall be informed and the equipment shall not be energised.

E2.2.4.5 FACTORY TESTS AND INSPECTIONS

The manufacturer shall perform all routine tests in the factory as described by SANS, IEC and/or BSS as well as the manufacturers own standard routine tests on all materials, equipment and auxiliary equipment. Type tests shall be performed as described in the relevant equipment specifications.

The Contractor shall submit a list of tests and inspections to be performed on the equipment for approval.

The Contractor shall perform any additional standard tests that may be required by the Engineer.

The Engineer shall indicate which tests shall be witnessed by a representative of the Employer and the Engineer.

The Contractor shall submit four copies of the test certificates with the test results of all the tests performed to the Engineer not later than the delivery date of the equipment.

E2.2.4.6 SITE TESTS

On completion of erection and installation on site the Contractor shall perform all the tests that may be required to ensure that the Works are ready for handing over and putting into regular use.

Contractors shall provide their own test equipment which shall be of accepted standards.

The Contractor shall submit a list of tests and inspections to be performed on the equipment for approval.

The Contractor shall perform any additional standard test that may be required by the Engineer.

All the tests shall be witnessed by a representative of the Employer and the Engineer.

Four copies of site test certificates shall be submitted to the Engineer within 7 days after completion of each test.

E2.2.4.7 FIRE EXTINGUISHERS, FIRST AID, DANGER & INSTRUCTION SIGNS FOR SUBSTATION

E2.2.4.8 FIRE EXTINGUISHERS

Unless otherwise specified, 5 kg type fire extinguishers or nearest standard sizes offered by manufacturers, shall be supplied for substation building.

Fire extinguishers shall be of the CO2 type or of a type approved for the fighting of fires where electrical apparatus and oil fires are involved.

Unless otherwise specified, fire extinguishers shall be provided as follows:

- Medium voltage switch rooms: One extinguisher per 30 m² of floor area.
- Low voltage rooms - one per room.
- Transformer rooms - one per transformer.

Fire extinguishers shall be mounted on suitable wall mounted brackets.

Fire extinguishers shall be installed next to exit doors wherever possible.

E2.2.4.9 DANGER SIGNS AND NOTICES

All outside doors of all substations and all substation yard entrance gates shall be provided with a sign showing a lightning strike.

Suitable notices prohibiting unauthorized persons from entering premises shall be provided on all doors and gates of substation buildings and yards.

The following notices shall be provided and mounted against walls inside substation buildings:

- A notice prohibiting unauthorized persons from handling or interfering with electrical apparatus.
- A notice containing directions as to resuscitation of persons suffering from the effects of electrical shock.
- A notice containing directions as to procedure in case of fire.
- One set of notices called for above shall be provided and installed for each substation building
- The notices shall be displayed at a prominent position inside the building.
- The notices shall be made from suitable plastic with engraved lettering.

E2.2.4.10 MATERIALS

Materials and equipment used in this Contract shall, where possible, be of South African manufacture and shall comply with this specification and relevant SANS, BSI and IEC Specifications and shall be approved and installed to the satisfaction of the Engineer.

The Contractor shall submit samples of all materials and equipment for examination by the Engineer before installation, unless prior consent to the contrary has been obtained in writing from the Engineer. Such samples will be held for comparison with equipment and materials installed and will be released on satisfactory completion of the Contract. Similar equipment and material shall be of the same manufacture and interchangeable and be standard products from established manufacturers.

Where a certain manufacturer's material or equipment is specified, listed in the Schedules or noted on the drawings, such materials or equipment shall be provided as specified, except where an alternative is allowed.

Where certain products of a specified manufacturer are unobtainable, substitutes may be offered, but shall only be supplied after written consent by the Engineer.

Where the words 'or approved alternative' follow a manufacturer's name and catalogue reference, the materials shall be of the specified manufacture and reference, or, if the Contractor wishes to use a substitute the onus shall be on the Contractor to prove such substitute is equivalent to the specified manufacture and reference. The decision, as to the acceptance of such substitute, shall rest solely with the Engineer, whose decision shall be final. If the Engineer instructs the Contractor to install the materials of the specified manufacture and reference, then no alteration to the Contract Sum or rates shall be permissible.

The Engineer may instruct the Contractor to supply material or equipment and/or install any other make or manufacture of equipment than that specified and will issue variation orders where such change has cost implications.

Where a detailed specification for material or equipment is not provided, the Contractor shall select such material or equipment to comply with normal practice and to suit the particular application in all respects.

E2.2.4.11 FINISHING AND PAINTING OF MATERIALS AND EQUIPMENT

The Contractor shall select materials and their finishing to avoid corrosion.

Exterior applications within 50 km of the coast shall be deemed corrosive.

Aluminium shall be anodised to SANS 999 - 1986 Grade A for exterior and Grade B for interior applications.

Unless otherwise specified, finish steel as follows: -

Interior Applications, And Non-Corrosive Exterior Applications

Galvanize to SANS 763 - 1988, or paint by :

- Preparing surface to SANS 064;
- Priming with zinc chromate to SANS 679 Type I of dry film thickness of 25 microns (minimum); and
- Applying two final coats of high gloss enamel paint to SANS 630 Grade 1, each coat of dry film thickness of 25 microns (minimum).

Exterior Corrosive Applications

- Hot dip galvanize to SANS 763 - 1988;
- Prepare surface to SANS 064 and prime with calcium plumbate to SANS 912 of dry film thickness of 25 microns (minimum);
- Apply undercoat to SANS 681 Type 2; and
- Apply two final coats of high gloss enamel paint to SANS 630 Grade 1, each coat of dry film thickness of 25 microns (minimum).

NOTE: Measure dry film thickness to SANS Standard Test Method 140 or 141.

Hot dip galvanise steel after all fabrication. Reinstate damaged hot dip galvanising (SANS 763) with hot zinc spraying. Reinstate damaged electro galvanizing with two coats of zinc-rich paint.

Any unpainted steel shall be chromium-plated or similarly plated to approval.

Where required paint aluminium surfaces as follows: -

- Thoroughly clean.
- Apply a self-etch primer to SANS 723 Plascon Hi-Sheen or approved alternative.
- Apply two final coats of high gloss enamel paint to SANS 630 Grade 1, each coat of dry film thickness of 25 microns (minimum).

E2.2.4.12 FIXING OF MATERIALS

Fix luminaries, metal draw boxes on surface, industrial surface mounted switches and plugs, metal channels, wiring troughs or trays, cable trays, saddles, conduit accessories, brackets, braces, trunking and all other surface-mounted material and equipment only as described below :

- Concrete (in situ) - expanding cast-in, or gun-bolted, metal screw-fasteners.
- Precast concrete - only with permission of the Engineer.
- Brickwork - expanding, or built-in metal screw fasteners.
- Ash brick - "J bolts" or approved alternative.
- Steelwork - drilled, gun-bolted, or tapped and screwed metal screw fasteners; or steel gun-bolt nails or, where permitted by the Engineer, welding.
- Woodwork - woodscrews, not nails.

- Hollow tiles - spring toggles of not less than 6 mm diameter, but only with permission from the Engineer.

- Exposed to weather - solid brass or stainless-steel screw-fasteners.

Where any equipment or material is to be mounted on the surface of ceilings, false ceilings, dry wall partitions, gasbeton or other specialised surfaces, mount such equipment or material only as specified by the Engineer or as permitted by the Engineer in writing.

Where sizes of fasteners etc. are not specified, submit samples and proposals to the Engineer for approval.

Do not gun-bolt into ash bricks, brickwork, gas-beton or precast concrete, except as permitted by the Engineer in writing.

The Contractor will be held responsible for any damage to Builder's work due to unauthorised inadmissible gun-bolting.

Do not use plastic plugs, wooden plugs or any other soft substance type plugs.

"Fischer", or approved alternative hard nylon plugs of not less than 6 mm diameter may be used for fixing light materials to suitable surfaces.

Plugs shall not be installed in mortar joints between bricks.

Provide suitable washers under screw heads and nuts.

Install materials in accordance with manufacturer's instructions and recommendations in all respects including type, size and spacing of fixings.

E2.2.4.13 INSTALLATION

(a) The Contractor shall check the dimensions of access ways and the space provided for DBs, MCCs and other panels on the latest architectural drawings to ensure that the enclosures are appropriately designed.

(b) Unless otherwise stated in the Project Specification, floor-mounted enclosures shall be mounted over cable trenches. Trench bridging supports shall be provided at the ends of the enclosure and at every second section. The supports shall be manufactured in the form of a top-hat section from 3 mm thick steel and then hot-dip galvanised.

E2.2.4.14 LOW VOLTAGE SWITCHGEAR AND CONTROLGEAR

General

Switchgear, control gear and instrumentation shall be rated for the system voltage, frequency and number of phases and for the load current and applicable maximum prospective fault current as specified on the drawings and the Project Specification.

Surge arresters

Surge arresters shall be provided for each phase in all boards, connected to each phase of the incoming cables.

Surge arresters shall conform to the relevant SANS codes and other Specifications, shall bear the SANS mark, and shall be solidly earthed directly onto the cubicle earth bar by means of a copper strap and be as short and straight as possible.

Air circuit breakers (ACBs)

ACBs shall be of the metal-clad, with-drawable type complying with the relevant codes and specifications. Unless otherwise stated in the Project Specification, the ACBs shall be three pole.

ACBs shall have an adjustable thermal overload trip unit and an adjustable magnetic short-circuit trip unit. All trip units shall be direct acting. Both trip units shall be replaceable by units of different ratings.

The ACBs noted on the drawings as "selective" shall incorporate an adjustable time-delay on the magnetic short-circuit trip unit.

ACBs shall be designed for trip-free manual closing and electrical tripping of the type specified in the project specification or drawings, e.g., shunt, remote or under voltage tripping; delayed contacts; AC or DC coil voltage.

Interlocking shall be provided to ensure that an ACB is fully isolated before access to any live terminals can be obtained.

ACBs shall be horizontally withdrawable allowing full maintenance and tests without the breaker having to be removed from the withdrawal mechanism.

Interlocks shall be provided to allow an ACB to be operated in the withdrawn maintenance/test position, and to prevent the circuit breaker from being closed unless fully in the engaged or test position and from being moved when the mechanism is closed.

Special equipment should not be required to remove the circuit breaker from its withdrawal mechanism for transporting. If special equipment is required, it shall be provided with the circuit breaker.

Lockable safety shutters shall be provided to screen the fixed contacts and shall operate automatically with the movement of the circuit breaker.

All non-current-carrying metal parts of the circuit breaker shall be solidly interconnected and connected to an earth contact which shall engage with a
copper plate connected to the main earth bar of the cubicle, and the arrangement shall be such that the circuit breaker frame is earthed before the circuit breaker contacts engage with the live fixed contacts.

A mechanically operated "ON/OFF" or ("I/O") position indicator shall be incorporated.

Facilities for padlocking in the "off" position shall be provided.

Two normally open and two normally closed spare auxiliary contacts shall be provided, unless otherwise noted. It shall also be possible to install a change-over contact if required at a later stage. Auxiliary contacts shall be capable of making and carrying continuously 1A AC or DC. They shall be capable of breaking 500 VA AC at 0,2 PF and 20 watts DC at an L/R of < 40 ms.

Where noted on the drawings special purpose interlocking (key/mechanical/electrical) shall be provided between ACBs.

Unless otherwise stated in the Project Specification, the ACBs shall have a one second fault withstand rating.

MOULDED CASE CIRCUIT BREAKERS (MCCB's**)**

Moulded case circuit breakers shall comply with the relevant codes and specifications. MCCB's shall be of flush panel mounting type.

MCCB's with ratings of 100 A and less shall be suitable for mounting on a DIN rail.

MCCB's with ratings in excess of 100 A for distribution networks shall each have an adjustable thermal overload trip unit and an adjustable magnetic short-circuit trip unit. Both trip units shall be replaceable by

units of different ratings. MCCB's for motor starter circuits shall be of the current limiting type with an adjustable magnetic short circuit trip unit.

MCCB's with ratings of 600 A or more shall have extension type operating handles, which shall be interlocked with the enclosure compartment doors to prevent the door being opened unless the MCCB is in the off position.

Mechanically coupled single-pole circuit breakers used as double or triple-pole circuit breakers are not acceptable unless overload releases are internally coupled.

The fault current interrupting rating of MCCB's shall not be less than the maximum prospective fault current and not less than 5 kA.

Neutral bars associated with each bank of MCCB's shall be positioned below each bank and shall be wired in the same sequence as the MCCB's.

MCCB's with shunt release shall have an auxiliary contact arranged to interrupt the shunt release current at the end of the opening operation. MCCB's with an under-voltage release shall be equipped with a time delay relay when specified.

MCCB's shall be fitted with the specified number of spare auxiliary contacts.Where spare auxiliary contacts are not called for, it shall nevertheless be possible to fit at least one normally open and one normally closed contact or a change-over contact at a later stage. Auxiliary contacts shall be capable of making and carrying continuously 1A ac or dc. They shall be capable of breaking 500VA ac at 0,2 PF and 20 watts dc at an L/R of < 40ms.

Where called for, MCCB's shall be capable of remote closing using the
specified control voltage.

MCCBs shall be lockable in the "off" position. A separate locking device may be used for this facility if so stated in the Project Specification.

Current limiting MCCB's will not be allowed unless otherwise stated in the Project Specification. 4.13. Where MCCB's are of the current limiting type the Contractor shall determine, and offer suitable ratings in collaboration with the MCCB supplier, to ensure discrimination and adequate short-circuit current capability. Calculations shall be submitted with the tender indicating the degree of current limiting and discrimination achieved as well as techniques used. Full details shall be submitted of the current limiting characteristics of each MCCB rating offered.

MCCB's for DC application shall be of the current limiting type and shall have at least one pole in the positive and one pole in the negative circuit. Where additional poles are required in series to meet requirements of the specified application, the series connections between poles of like polarity shall be such that they cannot be removed without special tools.

DISCONNECTORS

All disconnectors shall be of the "load-break-fault-make" type i.e. be switch disconnectors complying with the relevant SANS specification.

The disconnectors shall have the ratings specified on the drawings.

The handle of the disconnector shall form part of the panel door. It shall not be possible to close the disconnector without the door being closed and it shall not be possible to open the door without the disconnector being switched off.

Disconnector handles shall have an integral key lock or padlocking facility.

The fault carrying capability of the disconnectors shall be equivalent to or higher than the fault level of the associated busbar but not less than 5 kA.

SWITCHES AND SELECTOR SWITCHES

Switches and selector switches shall be switch disconnectors complying with the relevant SANS specification.

Switches and selector switches shall be capable of carrying, making and breaking the full rated current and of making onto the maximum prospective fault current.

The fault rating of switches and selector switches shall not be less than the maximum prospective fault current and not less than 5 kA.

The operating knob and indicator plate shall be manufactured of insulating material and the switch positions shall be clearly and indelibly marked thereon.

The switches and selector switches shall be provided with substantial contacts and the terminals shall be clearly marked and arranged for easy wiring.

The voltmeter or ammeter selector switch shall be mounted directly below the associated volt or ammeter.

Voltmeter selector switches shall be arranged so that voltages between phases, and phases to neutral, can be read. Voltmeter selector switches shall be of the break-before-make type.

The voltmeter selector switch shall have one "off" and six "metering" positions and shall be suitable for panel mounting in such a way that the operation knob and indicator plate can be mounted on the front of a panel and the switch itself at the back of the panel.

Ammeter selector switches shall be of the make-before-break type with one "off" and four "metering" positions arranged to read the current in each phase and in the neutral. When in the "off" position the metering circuit shall be short-circuited.

The physical construction of ammeter selector switches shall conform to that of voltmeter selector switches.

Switch enclosures shall be provided with an interlocked cover to ensure that the switch is in the "OFF" position before the cover can be opened for inspection or fuse removal. It shall not be possible to close the switch without the cover being closed.

Switches shall be provided with a clear "ON/OFF" or "I/O" position indicator.

TIME SWITCHES

The contacts shall be silver-to-silver or other approved single-pole changeover contacts rated at 16A and operated by a spring-driven clockwork, electrically wound with a spring reserve of 8 hours minimum.

Time switches shall be fitted with a manual overriding switch.

An external bypass switch shall be provided in each time switch circuit.

Time switches shall have the following features :

- daily programmable with minimum 30 minute "on" and "off" control facilities.
- weekly programmable with day omission facilities of minimum 12 hours, i.e. mornings or afternoons;

The whole mechanism shall be totally enclosed in a dust-proof enclosure.

PHOTO SWITCHES

Photo switches shall comply with the relevant codes and specifications.

Photo switches shall have silver to silver or other approved single-pole changeover contacts rated to switch a reactive load of 1800 VA at 230 V and 50 Hz.

An external bypass switch shall be provided in each photo switch circuit.

The photo-electric cell shall switch streetlights "ON" when daylight drops to approximately 40 lux and it shall switch "OFF" at approximately 80 lux.

The photo-electric cells shall have a time delay of not less than 30 seconds.

Photo-electric cells shall be completely waterproof and shall be of robust construction.

The material of the cover shall not crack, deform or deteriorate in any way whatsoever and shall be colour-fast in all weather conditions.

The photo-electric cells shall be provided with built-in lightning arresters.

Samples of photo-electric cells shall be submitted to the Engineer for approval prior to the ordering thereof.

The prices for the erection of photo-electric cells shall include the supply and delivery and the connection of cables, etc., from the photocells to LV cubicles, DB's or mini-subs.

COMBINATION FUSE-SWITCH (CFS) UNITS

The fuse-switch units shall comply with the relevant codes and specifications and shall be fitted with high rupturing capacity (HRC) cartridge type fuses-links complying with the relevant codes and specifications.

Fuse-switches shall be capable of breaking the full rated current and shall have a fault current rating of not less than the maximum prospective fault current and not less than 10 kA for one second.

Fused isolators, i.e. fuse-switches which rely on the fuses to reduce the fault current through the switch portion to provide a higher fault current rating, are not permitted.

Fuse-gear with the fuses mounted in the cover of the unit, with one cover forming the operating lever, are not permitted.

Fuse-switch units shall have chassis and be designed to accommodate HRC fuse links. Fuse-switch units shall be of the double air-break, quick-make, quick-break type and shall have a spring mechanism smoothly driven by springs on both sides of the mechanism.

The fixed contacts shall be shrouded and arranged so that when the switch is in the open position the double-break isolates the HRC fuse links so that they can be replaced in complete safety.

Fuse-switch units shall be triple-pole units and neutral links shall be provided inside the back of the distribution boards to facilitate routine testing.

All components shall be capable of continuously carrying rated current without excessive temperature rise.

Fuse-switch units shall be provided with interlocks such that:

- The cover panel cannot be opened whilst the switch is closed; and
- the unit cannot be operated with the cover open unless an interlock is purposely defeated.

The fuse-switch shall have a handle and an ON/OFF position indicator mechanically operated by the moving contacts to ensure accurate and positive indication.

Provide facilities for padlocking in the "off" position.

In all cases, the top terminal of fuses shall be the live terminal.

Six spare fuses shall be provided for each rating fitted.

FUSE LINKS AND HOLDERS

Fuse links shall be high-rupturing capacity (HRC) cartridge type fuse links conforming to the relevant codes and specifications.

HRC fuse link holders shall be of the with-drawable bakelite type and shall conform to the relevant codes and specifications.

Each fuse link and holder shall incorporate a visual inspection eye for fault location.

Fuses protecting a specific instrument shall be mounted as a group in close proximity to the relevant instrument.

A label with the rating of each fuse shall be mounted in close proximity to the relevant fuse holder or fuse switch.

Striker pin switches shall be provided if specified in the project specification in order to trip the associated breaker or contactor to prevent the occurrence of single phasing.

Six spare fuses shall be provided for each rating fitted.

The spare fuses shall not be used by the Contractor during erection, commissioning or maintenance.

EARTH LEAKAGE PROTECTION UNITS

Earth leakage protection units shall conform to the relevant codes and specifications.

All single and three phase socket outlets shall be provided with earth leakage protection devices unless specifically excluded in the Code of Practice for the Wiring of Premises.

All units shall have test push buttons and, unless otherwise specified the sensitivity shall be 30 mA.

Earth leakage shall be arranged to disconnect the faulty circuit from both phase and neutral of a single phase system, and from all three phases of a three phase system.

CONTACTORS

All contactors for low voltage shall be of the electro-magnetic operated air-break type with specific requirements as specified in the project specification or drawings e.g. AC or DC coil voltage; dip-proofing, latched contacts etc.

Contactors shall be in accordance with the relevant codes and specifications. Category AC3 or DC2 shall in general be used, whichever is applicable. Category AC4 and DC3, whichever is applicable, shall be used for heavy plugging and inching duty systems, e.g. cranes, etc.

Contactors shall have suitable capacities for direct-on-line starting, star delta starting or any other form of starting, whichever is specified in the project specification and the drawings. The contactors shall be rated for at least 130% of the associated load current.

Each contactor shall be provided with at least two normally open and two normally closed auxiliary contacts, unless otherwise specified.

Contactors shall be suitable for remote and automatic operation where 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 on additional contactor, shall be provided.

Each contactor shall be capable of carrying, making and breaking overcurrent's 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 contactor shall be co-ordinated with the short circuit protective device to ensure adequate protection for the specified operational current, voltage and the corresponding utilisation category according to Type 2 Co-ordination as per IEC 947, i.e. that, under short-circuit conditions, the contactor or starter shall cause no danger to persons or installation and shall be suitable for further use.

E2.2.4.15 EARTH BARS

A main earth bar shall be mounted at the bottom along the full length inside the switchboard and may be bolted to the framework of the switchboard. For back access switchboards, the earth bar shall be mounted at the rear. The steelwork of a switchboard and in particular gland plates shall be solidly and effectively bonded to the main earth bar. Earth bars shall have sufficient ways for all the earth conductors and, in addition, 30% spare space shall be provided.

Switchboards with short-circuit ratings in excess of 5 kA shall be equipped with a copper earth bar with a cross section not less than $S = 0{,}006 \times I$ mm² where "S" is the area in mm² and "I" is the maximum prospective fault current in Amps. However, in main DBs and MCCs, the earth bar shall not be less than 70 mm x 8 mm in cross-section, and shall be fitted with earthing studs in each section of the enclosure.

Switchboards with short-circuit ratings not exceeding 5 kA shall be equipped with an earth bar comprising box terminals with pressure shoes on a rectangular copper bar measuring at least 2,5 mm x 12,5 mm mounted on insulating pedestals. An earthing stud shall be welded to the metal tray of the distribution board. An earthing conductor equal in cross-sectioned area to the incoming earthing conductor shall connect this earthing stud to the earth bar.

E2.2.4.16 CURRENT TRANSFORMERS

Current transformers shall comply with the relevant codes and specifications and shall be marked clearly and indelibly as specified therein on a rating plate securely attached to the transformer.

Each panel shall be equipped with the current transformers as specified in the Project Specification and or drawings.

Current transformers shall be suitable for a system with an effectively earthed neutral or an non-effectively earthed neutral as specified in the Project Specification.

For current transformers with a system voltage less than 3,6 kV the insulation level shall be determined by the rated short duration power frequency withstand voltage e.g. 2 kV for a 400V system.

Current transformers with system voltages greater than 3,6 kV shall be insulated to withstand test voltages defined by the rated lightning-impulse and short-duration-power-frequency voltages and shall be as follows for indoor switchgear:

HIGHEST VOLTAGE FOR EQUIPMENT R.M.S. KV	RATED LIGHTING-IMPULSE WITHSTAND VOLTAGE (PEAK) KV	RATED POWER-FREQUENCY SHORT DURATION WITHSTAND VOLTAGE (r.m.s.) KV
3.6	40	10
7.2	60	20
12	95	28
24	125	50
36	170	70

The short-time thermal and dynamic current rating of current transformers shall not be less than that of the associated circuit breaker, isolator or busbar.

The rated primary currents of current transformers shall be 10, 15, 20, 30, 50 and 75 Amperes or their decimal multiples.

The current transformers secondary ratings shall be 5A unless otherwise specified.

Current transformers shall be accessible and easily removable. All current transformers of any one type and rating shall be identical and interchangeable with one another.

The class of insulation of current transformers shall be Type A (maximum temperature rise 60°k) unless otherwise specified.

Protection current transformers shall be of the low reactance type having toroidal cores with fully distributed secondary windings. Turns compensation shall not be utilized on protection current transformers.

The error in turns ratio on any tapping of a Class X current transformer shall not exceed ±0,25%.

The same set of current transformers shall not be used for both indication instruments and protective relays, separate cores having a low saturation factor (<than 5 preferably) shall be used for metering.

The VA ratings shall be sufficient to operate the various metering equipment and relays but shall not be less than 10 VA.

The accuracy limit factor of the protection current transformers shall be 15 unless otherwise specified.

The following classes of current transformers shall be used.

FUNCTION	DESCRIPTION	CLASS
Metering	kVA, kW and KWh meters	0,5
Indication	Indication Ammeters	1,0
Protection	Protection Over-current, earth fault and thermal overload	10P

The arrangement of the current transformer cores with respect to the primary terminals and mechanism of the circuit breaker shall be approved by the Engineer prior to manufacture.

Where it is not possible to easily read the rating plates of current transformers, additional rating plates shall be located on the rear inner panel of the breaker cubicle relay compartment for each current transformer where they can be easily read. These shall be a duplicate of the rating plates which appear on each current transformer. In addition, the phase colour with which each current transformer is associated shall appear beneath each rating plate. Information shall be provided on the above rating plates to indicate which secondary terminals are associated with which winding. This information shall be in addition to that called for in the relevant codes and specifications. The information on the additional plates shall include the relative arrangement of the current transformer cores with respect to the circuit breaker terminals and shall also indicate their polarity.

Secondary windings of current transformers shall be earthed to the approval of the Engineer at one point only. Each group of current transformers (i.e. protection, metering, etc.) shall be earthed directly to the earth bar by way of isolating links of the type where the link cannot be removed from the terminal. These links shall be readily accessible and safe with the circuit breaker in the isolated position. They shall not be in a live compartment.

All current transformer connections shall be brought to a terminal block in an easily accessible position inside the switchgear relay panel. If remote metering is specified in the project specification, then the metering current transformer shall also be wired to an easily accessible terminal block at the back of each panel. A metering test block with special links shall be provided to make changes to the remote metering circuits possible without the danger of opening the CT's on load.

Each LV current transformer shall be of the ring type and be provided with a robust mounting bracket and approved terminal studs on the circumference of the coil for the connections. The current transformers shall be mounted on rigid supports in such a manner that the axis of the coil is in a vertical plane to facilitate the threading through of the interconnecting wiring to the relevant switchgear.

Current Transformer Testing

Test certificates shall be submitted to the Engineer and be included in manuals. Test shall be executed in accordance with the relevant codes and specifications.

Type Tests

Type tests are not required if the manufacturer holds certificates of type tests on a similar transformer. Type test certificates shall be provided upon request by the Engineer.

Routine Tests : General

Verification of terminal markings and polarity tests.

Insulation test shall be made on the windings as specified as follows:

- Power frequency tests on primary windings and measurements of partial discharges.
- Power frequency tests on secondary windings and between sections of primary and secondary windings.
- Overvoltage interturn tests.

Additional Routine Tests for Measuring Current Transformers

- Tests shall be performed to verify limits of current error and phase displacement.

Additional Routine Tests for Protection Current Transformers: Class 10P

- Tests shall be performed to verify limits of current error and phase displacement.

- Tests shall be performed to verify limits of composite error.

- Secondary winding resistance corrected to 75°C.

Additional Routine Tests for Special Purpose Current Transformers: Class X

- Routine tests shall be performed to verity and establish the following:

    - Rated knee-point e.m.f.
    - Exciting current.
    - Secondary winding resistance corrected to 75°C.
    - Turn ratios.
    - A magnetising curve shall also be provided to the Engineer for Class X current transformers prior to the installation of current transformers in the switchgear.

E2.2.4.17 WIRING IN DB's, MCC's AND PANELS

In general all internal wiring in the cubicles shall be carried out in 600V PVC insulated copper multi-strand conductors. If the internal ambient temperature of the cubicle is likely to exceed 50°C silicon rubber insulated stranded copper conductors shall be used. The minimum cross-sectional area for control circuits shall be 1 square mm and 2.5 square mm for load and CT circuits. The current carrying capacity of conductors shall be determined in accordance with the relevant codes and specifications taking the appropriate correction factors for ambient air temperatures, grouping and condition of use into account.

Where several conductors are used, these shall be neatly grouped and bound together in groups not exceeding 10 conductors and shall be arranged in neat vertical or horizontal rows or installed in PVC trunking with slotted sides. Wiring shall follow the board construction features as far as possible without the twisting or crossing of conductors.

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. Connections of conductors to equipment i.e. circuit breakers, isolators or contactors shall be made by a ferrule of correct size or by the soldering of the end of the conductor. Conductors connected to terminal blocks need not to be soldered or ferruled. Conductors terminating on meters, fuse holders and other equipment with screwed terminals shall be fitted with pre-insulated lugs. The lugs shall be soldered or crimped to the end of the conductor. The correct amount of insulation shall be stripped from the end to fit into the terminal. Strands may not be cut from the end of the conductor. Crimping tools used shall be of the ratchet type and indent an identifying symbol on the terminal insulation.

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.

Only wires of the same potential shall be grouped together and power control circuit wiring shall be in separate wiring channels. Wiring channels shall not be more than 60% full.

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.

Additional red cable markers marked "T" in white shall also be fitted on wires associated with trip circuits.

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 screen marked "ISOLATE

FEEDER BEFORE REMOVING SCREEN". If any circuits are energised from other sources, clear warning notices to that effect shall be fitted and such terminals shall be clearly marked.

All control terminals shall be accessible from the rear, except in the case of front access boards.

Where neutral connections are looped between the terminals of instruments a common lug or ferrule shall be used to ensure that the neutral is not broken when the instruments are removed.

The supply end connections to all equipment shall always be at the top and the load end connections at the bottom.

Solid copper busbars shall be used to connect equipment to the main busbars where the current rating exceeds 200A and shall be insulated by means of at least two half lapped layers of PVC tape.

A maximum of two conductors shall be used per equipment terminal.

Where small leads are connected directly onto busbars, such as for voltmeters, etc. they shall be provided with a 20A fuse mounted directly on the busbar and a 2 Amp fuse at the piece of equipment on the front of the panel.

Unless otherwise approved the following insulation colours shall identify wiring:

Description	**Colour**
Red phase of 3-phase circuits	red
White phase of 3-phase circuits	white
Blue phase of 3-phase circuits	blue
Live of single-phase circuits	red
Neutral	black
Earth	green/yellow
Alarm circuits	orange
AC control circuits	red
DC control circuits	blue
Neutral	black
Instruments	grey

In DBs and MCCs, accessible PVC wireways shall be provided for wiring between compartments. Signal cabling shall be run in galvanized steel conduit.

Internal wiring shall be kept separated from external wiring and, as far as possible, the internal serving of cables entering the enclosure shall be left around conductors until the cable enters the compartment to which it is connected.

Low current signal cables shall be kept separate from power cables up to the point where the conductors are connected to the terminals on the equipment. Where required, Sheetmetal wireways shall be provided to ensure this separation.

E2.2.4.18 GLANDS AND GLAND PLATES FOR PVC AND PILOT CABLES

Glands

Mechanical cable glands and flameproof glands shall comply with the relevant codes and specifications.

When specified in the project specification glands shall be weatherproof, dust ignition proof, hose-proof or for use on type 'e' enclosures i.e. use in explosive gas atmospheres.

Glands shall be provided with brass locknuts and double outer sealing in corrosive environments. Areas which are classified as highly corrosive shall be equipped with H-C (Hydrocarbon resistant) or UV-C (Ultra-Violet and chemical resistant) seals as may be applicable.

Glands and components shall be manufactured of non-corrosive material such as nickel plated brass.

Adjustable cable glands of the correct size designation shall be provided in switchboards for all cable types as specified.

Glands shall be equipped with cable or armour gripping devices as may be applicable and shall be constructed to ensure electrical earthing continuity between the armour of the cable and the gland plate or the metallic structure. Glands shall be provided with an earthing bond attachment of acceptable rating.

It shall be possible to convert glands for armoured cables to be suitable for unarmoured cables by replacing the cone bush and compression ring with a rubber compression bush and rings.

Where cables with metal screens or metal sheaths are specified the gland shall be designed to earth the screen or sheath through the gland on the earth bar. It shall be possible to bring earth continuity conductors through glands for ECC cables without having to cut grooves in the barrel or cone bush. Suitable replacement parts shall be used.

Glands for outdoor use shall be equipped with a waterproofing shroud and an inner seal kit.

All pilot cable ends shall be made off in glands as prescribed by the manufacturer, of correct size and complete with neoprene shrouds if used outdoors at mini-subs or outdoor cubicles. The armouring shall be clamped between substantial tapered sections, which form an integral part of the gland, secured by lock nuts to give a earth connection.

Gland Plates

Gland plates for cable entries to boards will be from above and/or from below as specified in the drawings of project specifications.

Gland plates shall be at least 200 mm above the normal floor level.

Gland plates shall be from non-magnetizing material where single core cables are terminated to the boards.

E2.2.4.19 SWITCHBOARD ACCESSORIES

Control Push Buttons

General

Push buttons shall comply with the relevant codes and specifications.

Push buttons shall be provided by a single reputable supply and shall be selected for the required rating, contact action, duty, environmental conditions e.g. temperatures and vibrations and mounting characteristics e.g. flush mounted, enclosed, self-contained, illuminated, etc.

All push buttons shall be of the same physical dimension and shall be interchangeable between normally open and normally closed contacts. Push buttons shall preferably also be interchangeable with indicator lamps, key switches, etc. All push buttons shall be provided with replaceable lenses.

Push button terminals shall be suitable for conductor sizes to be used. Push button assemblies mounted on doors of control boards shall be enclosed to prevent inadvertent contact with the terminals and when the doors are open.

Contacts shall be silver-tipped or be constructed of an approved high quality material.

Push buttons shall be labelled by means of removable legend plates clearly indicating it's function. Legend plates shall be interchangeable.

When specified keylock push buttons shall be supplied with duplicate keys. The removal action of the key shall suit the application.

Illuminated push buttons shall comply with the specification for indicator lamps and lights.

Motor Control Centres

All motor control cubicles shall be provided with "STOP/START" push buttons as follows (or as specified in the Project Specification):

Description	**Colour**
Start Button	Green
Stop Button	Red

When specified in the Project Specification or indicated on drawings the following push buttons shall be provided:

Description	**Colour**
Trip Reset Button	Black
Emergency Stop Button	Red with yellow background
Lamp Test Button	White
Any Other Function Button	Pale Blue

Start push buttons shall have normally open contacts. Stop push buttons shall have normally closed or normally open contacts, as may be required.

Switchgear

When specified in the Project Specification or indicated on drawings push buttons shall be provided as follows:

Electricity Controlled Switchgear

Description	**Colours**
Open Button	Green (O)
Close Button	Red (I)
Reset Button	Black
Lamp Test Button	Yellow
Any other Function Button	Pale Blue

Signal Lights

General

Indicator lights shall comply with the relevant codes and specifications.

Indicator lights shall be provided as specified in the Project Specification and indicated on drawings.

Similar cluster multi-led (8 chip) long life signal lamps shall be provided for all indications.

LED’s shall be selected and rated for the specified control voltage and shall be equipped with a suitable current limiting protection resistor. Each LED shall be provided with a Zener transient protection diode. Suitable LED's are type MDA 22 for AC applications under 110V and DC applications, and type MAC 22 for AC applications above and including 110V as obtainable from Mimic Crafts. Equivalents shall be submitted for pproval by the Engineer.

Indicator light lenses shall be of the same size, shall have a minimum diameter of 22 mm and shall be of the front removable screw type. The lamps shall be replaceable from the front of the panel without the use of tools. Indicator light construction shall be suitable for the operating environment and shall be equipped with interchangeable lenses.

Indicator lights shall be labelled by means of a removable legend plate clearly indicating it's function. Legend plates shall be interchangeable.

Two spare lamps shall be provided for each type and colour lamp used on the boards unless otherwise specified.

The spare lamps shall not be used by the Contractor during erection, commissioning or maintenance.

Motor Control Centres

When specified in the Project Specification or indicated on the drawings, the following indicator lights shall be provided:

Description	**Colours**
Drive stopped, power available	White
Drive running	Green
Drive tripped	Red
Emergency stop activated	Yellow
Moisture ingress	Blue

Switchgear

The following lens colours shall be used:

Description	**Colours**
Circuit Breaker, Isolator closed or abnormal state	Red
Circuit Breaker tripped (caution)	Yellow
Circuit Breaker open (ready for operation)	Green
Interlocking	White
Other functions	White

Note: Painted lenses shall not be acceptable.

Where indicating lamps are supplied from the substation batteries, it shall be separately wired to an easily accessible terminal block at the back of the board and shall not form part of the wiring of the spring charge mechanisms of equipment or tripping circuits. The indicator lights shall be wired to a lamp test push button mounted on one of the cubicles, preferably a bus-coupler or an incomer. The lamp test circuit shall be equipped with a timer (0-10 min) to prevent the unnecessary drainage of batteries.

E2.2.4.20 NAME PLATES AND LABELS

NAME PLATES

All equipment shall be provided with a manufacturer's name plate/plates fixed in an easily accessible and readable position on equipment or inside cubicles showing the following data.

The manufacturers name or trademark.

Type, designation or identification number or other means of identification making *it possible to obtain relevant information from the manufacturer of equipment.

SANS or IEC Designation.

Rated operational voltage.

Short circuit strength in kA.

Degree of protection IP rating.

Maximum current carrying capacity of busbars.

Maximum current carrying capacity of equipment.

Voltage transformer ratio (where applicable).

Current transformer ratio, burden, class and knee point voltage (where applicable).

Current transformer connection instructions for various CT ratios (where applicable provide separate nameplate close to the relevant terminal blocks).

LABELLING

Labels shall generally have black lettering on a white background. Danger and safety notices shall have red lettering on a white back- ground and be in both official languages.

Labels shall be engraved "trafolite", aluminium or an approved alternative secured with screws, not glue, or in an approved aluminium guide rail.

Lettering shall generally be 6 mm high except that of "main switch", "hoofskakelaar", "local switch" and "plaaslike skakelaar" which shall be 10 mm high. The lettering of labels indicating names of panels shall be 20 mm high.

Each cubicle shall also be provided with labels of similar wording at the back of the cubicle.

Where possible labels shall not be fixed to removable panels or doors.

The manufacturer shall consider the wording on the drawings as preliminary only and shall obtain the correct final wording from the Engineer before the labels are manufactured.

All equipment situated inside the board, e.g. contactors, relays, fuses, timers and time switches, shall be clearly labelled indicating function and circuit controlled.

Typical labels are as follows: -

Cabinet: cabinet description.

Incoming cables/busbar: size and origin.

Main disconnector: "main switch", "hoofskakelaar" and danger notice.

Local disconnector: "local switch", "plaaslike skakelaar" and danger notice.

Fuses and combination fuse switches: circuit designation and fuse rating.

Circuit breakers: circuit designation and overcurrent adjustment where applicable.

Earth leakage protection units: circuit designations.

Contactors, relays, time-switches, timers, control fuses, etc: designation of control circuit and circuits controlled, function and fuse ratings.

Push buttons: circuit designation and function.

Indicating lamps: circuit designation and condition.

Instruments and selector switches: circuit designation and phase colour.

Meters (kVA and/or kWh): circuit designation and phase colours where applicable, reading description, and a single multiplication factor for each reading.

Terminal blocks: terminal designations and function.

Current transformers: ratios and terminal designations.

E2.2.4.21 LEGEND CARDS FOR DISTRIBUTION BOARDS)

3.1 Install an index card in a holder, with a 2 mm thick transparent acrylic panel, screwed or welded inside a door, or where no doors are fitted, to the front plate of the cabinet. The legend card shall list the outgoing circuit designations in accordance with the layout and schematic drawings, functions and outlet locations.

E2.2.4.22 EARTHING

General

Bond and earth the services installation and extraneous conductive parts. The design and installation of an earth electrode shall be in accordance with the relevant codes and specifications. The services installation shall be bonded by means of earth conductors to the earth electrode via the earth bar.

Earth Electrode

Array of Earth Rods

Earth rods shall be at least 16mm diameter and at least 1,5m long and shall be of solid copper. Install each earth rod in a pre-drilled 50mm diameter hole. Fill with mud slurry after installation.

An array of earth rods shall be interconnected with 70mm² bare, stranded copper conductors buried 700mm underground. The earth rods shall be spaced at least 1,5m apart and not less than the depth of the rods below final ground level.

Unless otherwise noted, the array of earth rods shall consist of five rods, four in the form of a 3m square with a fifth in the centre. The interconnections shall form the sides of the square and shall form a cross thus connecting the centre earth rod.

Trench Earths

Trench earths shall comprise 70mm² bare, stranded copper conductors buried underground at a depth of a least 700mm below finished ground level.

Unless otherwise noted the trench earth shall comprise conductors extending 50m in four directions at right angles to each other, and connected at the centre.

Earth Mat

An earth mat shall comprise 70mm² bare, stranded copper conductors buried underground at a depth of at least 700mm below finished ground level in the form of a flat spiral of 24 turns spaced 25mm from each other thus approximate a circle of 1,75m diameter.

Earth Bar

3.1 Provide an earth bar in each LV switchroom for the bonding of the earth electrode, main distribution board earth bar, water mains, any Supplier's earth terminal, any transformer's neutral terminal and tank earth terminal and any HV switchgear frame.

The earth bar shall comprise a 50mm x 6,3mm copper section 500mm long with pre-drilled 10mm holes for connection bolts. Mount the earth bar in the cable trench on spacers away from the wall.

Connect the earth conductors to the earth bar by means of soldered or crimped lugs and 10mm diameter cadmium-plated steel bolts.

The earth conductors to the earth bar from the main distribution board, earth electrode, water mains, and transformer tank shall comprise 70mm² bare stranded copper conductor. The earth conductor to any transformer's neutral terminal shall comprise a 70mm² PVC-insulated copper conductor.

Earth Continuity

Provide earth continuity conductors to earth outlet and each metallic appliance and luminare.

The earth continuity conductors shall be separate bare or green PVC-insulated copper conductors when associated with wiring in wireways.

2,5mm² Earth continuity conductors shall be green/yellow PVC-insulated.

With a multi-core cable circuit, the earth continuity conductor may be a separate core of a multi-core cable identified with green sleeves at each end.

Where earth continuity conductors are looped between outlets the looped ends shall be twisted and ferruled without breaking the electrical or mechanical continuity of the earth conductor.

Bonding

Bond the water main to the earth bar where non-metallic pipes are used and connect the water meter and valves to the earth bar.

Bond metallic cold and hot water pipes, waste pipes, sanitary appliances, ventilation pipes and ducts by means of 12mm x 0,8mm solid or perforatcopper tape (not wire) clamped by means of brass screws and nuts.

Bond metallic roofs, gutters and downpipes to earth by means of 12mm x 0,8mm solid or perforated copper tape clamped by means of galvanised bolts and nuts.

Do not use self-tapping screws for any earthing or bonding functions.

Complete bonding work before painting.

Route copper bonding conductors on the outside of the building in securely fixed galvanised pipe from 2 000mm above ground level to 300mm below ground level.

Testing

Measure the resistance between the earth electrode and the mass of the earth by one of the methods described in the relevant codes and specifications.

Test the earth and bonding continuity in accordance with the Wiring Code.

Submit all test results to the Engineer in a written report before any permanent paving is provided over the earth electrode.

Earthing Of Fences

Earth the fence of outdoor transformer and/or switchgear installations by means of a 70mm² bare, stranded copper conductor 400mm below ground level and 500mm outside the fence around the whole perimeter of the fence. At each corner, bond the perimeter conductor to the fence pole and to a 1,8m earth rod by means of a 70mm² bare, stranded copper conductor.

Bond the perimeter conductor to the main earth bar by means of a 70mm² bare, stranded copper conductor.

E2.2.4.23 WIREWAYS

General

Metallic wireways shall be electrically continuous and the maximum resistance between any two parts shall not exceed 1 ohm.

Wireways shall be mechanically continuous providing a degree of protection of at least IP3 X (that is providing protection against the entry of solid objects exceeding 2,5 mm diameter).

Unless otherwise required conduit installations shall provide a degree of protection of IP44, that is dust and splashproof. Exterior conduit installations shall provide a degree of protection of IPW65 (that is dust-tight, and hose and weather proof).

Where cabling is to be installed afterwards by others, provide galvanised steel draw wires in the wireways.

Space metallic wireways at least 160 mm and non-metallic wireways at least 300 mm away from gas, steam, hot water or similar piping. Prevent wireways from contacting piping so as to avoid electrolytic corrosion.

Conduit

General

No conduit shall be smaller than 20 mm diameter.

Types of Conduit and Applications

BLACK ENAMELLED STEEL CONDUIT

Black enamelled steel conduit shall comply with the relevant codes and specifications for both screwed metal conduit and plain ended metallic conduit. Black enamelled steel conduits may generally be used except:-

a) where exposed to the weather

b) where cast into concrete slabs in contact with the soil

c) where exposed to damp or corrosive environments

d) where "U" traps are formed

e) within 50 km of the coast

f) in kitchen and boiler rooms (in which locations galvanised steel shall be installed)

g) in animal houses

h) where protecting underground earthing conductors.

i) in plenums containing humidified air.

GALVANISED STEEL CONDUIT

Galvanised steel conduit shall comply with the relevant codes and specifications screwed metal conduit and plain ended metallic conduit and shall be hot dip galvanised to the relevant codes and specifications.

PVC CONDUIT

PVC conduit shall comply with the relevant codes and specifications and shall be installed strictly in accordance with manufacturer's recommendations. All PVC conduit and associated fittings and accessories shall be of one manufacture.

PVC conduit may only be used strictly in accordance with SANS 0142 and where:-

a) specifically noted or permitted by the Engineer,
b) not exposed to temperatures in excess of 50°,
c) not exposed to mechanical damage, and
d) not used to support any loads.

FLEXIBLE CONDUIT

Flexible conduit shall comply with the relevant codes and specifications and shall be constructed of metal-reinforced self-extinguishing plastic metallic flexible conduit with a sheath of self-extinguishing plastic. The internal diameter shall not be less than 15 mm. Flexible conduit connectors shall securely grip the conduit and be manufactured of zinc, or cadmium Plated steel, or brass.

Where flexible conduit is run in ceiling spaces which form air conditioning plenums, the flexible conduit shall be of galvanised, corrugated steel construction with no PVC components.

Flexible conduit shall terminate on a conduit box unless a draw box exists within 2 metres.

Installation of Conduit

GENERAL

The interior surface of conduits shall have no sharp protrusions. Fit brass bushes to steel conduit ends. Bond metallic conduit installations to earth and ensure earth continuity not exceeding 1 ohm. Fit lock nuts to running joints. Swab conduit cast into concrete to remove all traces of moisture.

Plug open conduit ends and exclude ingress of dirt and moisture.

CONCEALED CONDUIT

Unless otherwise specified, conduits shall be concealed by being cast into concrete or built into brick or blockwork as applicable. Chasing may only be carried out with the express permission of the Engineer and builder.

Route conduits in structural concrete as close as possible to the neutral axis and secure the conduits against movement.

SURFACE MOUNTED CONDUIT

Where surface mounted conduit is specified, it shall be fixed with spacer bar saddles. The maximum distance between saddles shall not exceed 2 m for steel conduit and 1 m for PVC conduit. A saddle shall be installed within 100 mm of a conduit box.

Remove labels from surface mounted conduit.

ROUTING OF CONDUIT

Conduit in roof spaces, ceiling voids and exposed areas shall be routed parallel and at right angles to structural elements with no diagonal routing.

Wherever possible, conduits shall be run in straight lines with easy curves and shall be drained. Manufactured bends except for 50 mm diameter conduit, and joints at bends, shall be avoided. The minimum radius of a bend shall be four times the conduit diameter.

TERMINATIONS OF CONDUIT

Terminate conduits to luminaires, appliances, conduit boxes and bonding trays as follows:-

a) Concealed Steel Conduit:

i) with two locknuts and a brass bush, or,

ii) with one locknut and a brass bush nut.

b) Surface mounted Steel Conduit:

With a coupling on the outside and a locknut and a brass bush or a brass bush nut on the inside.

c) PVC Conduit:

With a PVC threaded adapter and lock nut with no stress on termination.

CORROSION PROTECTION OF CONDUIT

Paint exposed running threads of black-enamelled steel conduit to be cast or built in with two coats of red lead primer or lap with PVC-insulation tape.

Paint exposed running threads of galvanised steel conduit with two coats of zinc-rich paint.

Provide at least 25 mm of cover to conduits cast into concrete.

Where the paintwork of black-enamelled steel conduit is damaged, prepare the surface and apply two coats of zinc-chromate primer.

Where the galvanising of galvanised steel conduit is damaged, prepare the surface and apply two coats of zinc-rich paint.

FUTURE EXTENSIONS

Provide galvanised steel conduit where future extensions are required. In roof spaces, terminate conduit stubs 40 mm above tie beams and where 900 mm clearance exists.

In concrete terminate conduit 150 mm beyond the concrete in the required direction and provide a draw box within 2 metres. Thread conduit ends and screw on a coupling and brass plug.

Where conduits are exposed, prepare the surface and apply two coats of calcium plumbate primer.

Conduit Boxes

General

Conduit boxes and their cover plates shall comply with the relevant codes and specifications as applicable. Strong mounting lugs and sufficient conduit knockouts shall be provided.

Metallic conduit boxes may be malleable iron or pressed steel and shall be galvanised where used with galvanised steel or PVC conduit.

Where conduit boxes are installed on the exterior they shall be galvanised, primed and painted steel, or malleable iron, or of suitable non-metallic construction and shall be dust, hose and weatherproof to IP65.

Where the temperature may exceed 60°C, for instance where incandescent or other luminaires are mounted against an outlet box, ordinary PVC boxes shall not be installed but steel, or heat-resistant non-metallic boxes shall be installed.

Blank Cover Plates

Fit blank cover plates to draw boxes and unused outlet boxes

The finish of blank cover plates to wall-mounted boxes shall match that of switch and socket outlet plates.

Install cover plates to ceiling-mounted boxes accurately flush with the ceiling and before painting of ceilings.

Install suitable brass cover plates to floor-mounted boxes accurately flush with the floor finish. The brass cover plates shall be sufficiently thick and reinforced to be rigid, shall be secured with countersunk brass screws and shall be sealed with gasket

Fit non-metallic cover plates with nylon screws to PVC conduit boxes.

Where boxes have been installed with fixing lugs below the finished wall surface fit spacers of coiled steel wire or of pipe as necessary.

Draw Boxes

Provide draw boxes to facilitate the drawing in of cables and particularly: -

1) after 180° of bends, and

2) after every 15m of straight runs.

Locate draw boxes to avoid spoiling the appearance of the building. The location of draw boxes shall be accepted by the Engineer.

Where several conduits on the same route require draw boxes a single, large draw box shall be provided.

Expansion Joints

Ascertain the location of structural expansion joints and install conduit expansion joints where conduits have to cross structural expansion joints.

The conduit expansion joints shall be arranged with a draw box as shown on the attached drawing.

Where several conduits on the same route cross a structural expansion joint a single, large draw box shall be provided.

The gap between the inner conduit and outer conduit sleeve shall be sealed with a suitable sealing compound.

Conduit Boxes related to Architectural Features

Where conduit boxes are to be mounted on wall or ceiling panels, tiled surfaces, panelling or other finishes, ensure that such boxes are installed symmetrically. Measure and co-ordinate such positions on site. It will not be sufficient to scale such positions off the drawings.

Where several outlets are close to each other, space them evenly and align them.

Trunking

General

Metallic trunking shall comply with the relevant codes and specifications. Steel trunking shall be manufactured of at least 1,6 mm thick steel and galvanised to the relevant codes and specifications as appropriate.

Where painting is required, prepare, apply a calcium plumbate primer and apply two coats of high gloss enamel paint, or apply a powder coating. All the painting shall be done in accordance with the relevant codes and specifications.

Where steel trunking is cut to length on site, render the edges smooth, prepare the surface, apply two coats of zinc-rich paint, and if painted, reinstate the paint system.

Light steel trunking may only be installed where specified and shall be manufactured of are least 0,8 mm thick steel epoxy polyester powder coated to the relevant codes and specifications.

Unless otherwise specified, provide bridges of 32 mm dia. conduit for each compartment between trunking routes and between trunking and distribution boards, telephone and communications panels.

Aluminium trunking shall be anodised to the relevant codes and specifications.

Installation

Install trunking complete with end caps, outlets, internal splices, covers, internal partitions, 2 clips, knockouts, adaptors, cable retainers, suspension rods, fixings, brackets, clamps, hangers, nuts, bolts, washers, screws and all other accessories required to complete the installation.

Install cable retainers at spacings of not more than 1 metre.

At changes of direction (elbows, tees, cross-overs, etc.), provide internal splices and exterior covers to present a smooth appearance.

Snap-in covers may be used on trunking up to 70 mm wide. Trunking wider than 70 mm shall be fitted with machine screws secured with retained nuts at sufficient points to prevent distortion of the cover.

Support trunking to prevent deflection beyond 1/180th of the span or beyond 3 mm whichever is the lesser.

Provide partitions to separate different services as required.

Power Skirting

Power skirting shall have 3 partitioned compartments unless otherwise specified.

Power skirting shall allow access to the telephone compartment without any danger of contact with live parts.

Provide cabling throughout power skirting and with sufficient slack to facilitate the addition and repositioning of outlets.

Powerskirting shall be finished in the scheduled colour.

Underfloor Ducting

Underfloor ducting shall have 3 partitioned compartments unless otherwise specified. Outlets shall allow access to the telephone compartment without any danger of contact with live parts.

Samples, shop drawings and complete technical literature with approvals, shall be submitted to the Engineer.

Install the underfloor ducting within an accuracy of ± 12 mm from the positions shown on the drawings. Prepare dimensioned "as-built" drawings of the installation.

Install the underfloor ducting complete with elbows, tees, cross-overs, outlets, outlet pedestals, end caps, adapters, fixings, and all other accessories required to complete the installation.

Provide cabling throughout underfloor ducting and with sufficient slack to facilitate the addition and repositioning of outlets.

The installation shall provide a degree of protection of IP 67 (that is dust and watertight) to IEC Publication 162 and be watertight to 12 mm water gauge.

Building Elements as Wireways

With the express approval of the Engineer, suitable building elements, such as hollow mullions may be used as wireways provided that:-

a) the wiring is not exposed,

b) metallic building elements are bonded to earth,

c) the building elements are non-inflammable or self-extinguishing, and

d) rewireability is facilitated.

E2.2.4.24 CIRCUITRY

Minimum Sizes

The following minimum wiring and cable sizes apply, unless otherwise specified:-

(i) PVC-insulated wiring and cabling for single-phase power and lighting - 2,5mm²

(ii) PVC-insulated wiring and cabling for signal, control, alarm and communication - 1,5mm²

(iii) PVC/PVC/SWA/PVC cabling for three-phase circuits - 1,5mm²

Neutral Conductor

A neutral conductor, equal in size to the phase conductors shall be run to each three-phase outlet and appliance unless otherwise specified.

Segregation of Circuits

Separate wireways, or separate compartments of multi-compartment wireways shall be provided for the following circuits: -

1) normal power and lighting circuits
2) emergency power and lighting circuits

3) standby power and lighting circuits

4) low voltage (50 V to 1 000 V) control, instrument, signal and alarm circuits

5) extra low voltage (up to 50 V) control, instrument, signal, alarm, fire detection, intercommunication circuits

Identification Colours

The following colours shall be used to identify wiring and cable cores:-

Description	**Colour**
Red phase of 3-phase circuits	red
White phase of 3-phase circuits	white
Blue phase of 3-phase circuits	blue
Live of single-phase circuits	red
Neutral	black
Earth	green/yellow
Alarm circuits	orange
AC control circuits	red
DC control circuits	blue
Neutral	black
Instruments	grey

Three-phase circuits shall be terminated with the red phase on the left, white phase central and blue phase on the right viewed from the front of the switchgear.

E2.2.4.25 CABLE TRAYS AND LADDERS

General

Steel cable trays and ladders shall be galvanised.

Where painting is required, apply a calcium plumbate primer to SANS 912:1972 and apply two coats of high gloss enamel paint to SANS 630:1972, or apply an epoxy-polyester powder coating to SANS 1274:1979.

Cable trays and ladders and their accessories shall be pre-manufactured. On site fabrication will not be allowed without the express permission of the Engineer. Where standard lengths are cut on site, render smooth the cut edges, prepare the surface, apply two coats of zinc-rich paint and if painted, reinstate the paint system.

Installation

Install cable trays and ladders complete with cross-overs, tees, reducers, bends, elbows, cornices, splices, traying arms, fixings, brackets, "unistruts", clamps, hangers, nuts, bolts, washers, screws and all other accessories required to complete the installation.
Support cable trays and ladders to prevent sagging beyond 1/180th of the span or 3mm whichever is the lesser. Each length shall be supported in at least two places along the length. The diameter of expanding bolts, studs, etc., and nuts, bolts and patent fixings, etc., securing the trays and ladders shall not be less than 10mm.

Heavy Duty Cable Ladders

Cable ladders unless otherwise specified, shall be heavy duty manufactured of sheet steel at least 2,0mm thick with shoulders at least 76mm high. Cable ladders and accessories shall be hot-dip galvanised to SANS 763:1977.

Rungs shall be spaced at intervals not greater than 300mm. Bends, tees, elbows, cross-overs and reducers shall have minimum radii of 450mm.

Support cable ladders on traying arms, GKN P2231/2232/2233/2234 or approved alternative of length to suit ladder width and fitted with end caps.

Cable ladder lengths over 3m shall be supported in at least three places along the length.

Bolts, nuts and washers securing splice pieces shall be at least 6mm diameter.

Where cable ladders ramp slightly so that a bend is not required provide hinged splice pieces hinging on 8mm nuts, bolts and washers and with radiused corners.

Light Duty Cable Ladders

Light duty cable ladders may only be installed where specified or where expressly permitted by the Engineer. These cable ladders shall be manufactured of sheet steel with shoulders comprising 41,3mm x 10mm x 1,6mm pressed steel channels. Cable ladders and accessories shall be hot dip galvanised to SANS 763:1977. Rungs shall be spaced at intervals not greater than 300mm. Bends, tees, elbows, cross-overs and reducers shall have minimum radii of 300mm. Support cable ladders on traying arms GKN or approved alternative of length to suit ladder width and fitted with end caps. Cable ladder lengths over 3m shall be supported in at least 3 places along the length. Changes of direction shall be undertaken with manufactured elbows hinged horizontal splices or hinged vertical splices. Bolts, nuts and washers securing splices shall be at least 10mm diameter.

The hinge pin of the hinged horizontal splice shall be at least 8mm diameter.

Hinged horizontal or vertical splices may be used for elbows and bends up to 45°. Manufactured elbows and bends shall be used for elbows and bends over 45°.

Light duty cable ladders shall be GKN H41/10 or approved alternative.

Heavy Duty Cable Trays

Cable trays, unless otherwise specified, shall be heavy duty manufactured from perforated sheet steel at least 2,5mm thick with shoulders at least 76mm high. Heavy duty cable tray and accessories shall be hot-dip galvanised to SANS 763:1977.

Provide cornices at changes of direction to allow minimum bending radii of cables.

Support heavy duty cable trays on traying arms, GKN P2231/2232/2233/2234, or approved alternative of length to suit tray width and fitted with end caps.

Light Duty Cable Tray

Light duty cable trays may only be installed where specified or where expressly permitted by the Engineer and shall be manufactured from perforated sheet steel at least 1,2mm thick with shoulders at least 19mm high. Light duty cable trays and accessories shall be galvanised to SANS 934:1969 heavy class.

Provide cornices at changes of direction to allow minimum bending radii of cables.

Support light duty cable trays on traying arms, GKN P2491/2492/2494/2495/2497/2500 or approved alternative of length to suit tray width.

E2.2.4.26 ACCESSORIES: LIGHT SWITCHES AND SOCKET OUTLETS

Light Switches

General

Wall switches shall comply with SANS and bear the SABS mark and shall be of the tumbler-operated microgap type. Submit samples to the Engineer for approval.

Wall switches shall be rated for 230V 16A. Install wall switches with the centre 1 400mm above finished floor level

Switch boxes and cover plates shall comply with SANS 1085 and SANS 1084.

Multiple switches may be allowed only if the switches control the same circuit. Switches controlling separate circuits on different phases shall be installed in separate boxes.

Switch toggles or rockers shall operate in a vertical direction.

Where indicating lights are specified, they shall form an integral part of the switch and shall have neon lamps or light-emitting diodes.

Light switches shall be finished as scheduled.

Metallic switch plates shall be secured with two chromium plated countersunk screws. Non-metallic switch plates shall be secured with two nylon countersunk screws.

Flush Wall Switches

Where conduit is routed flush, install flush wall switches built into conduit boxes.

Surface-mounted Flush-Pattern Switches

Where flush-pattern switches are to be mounted on the surface they shall be mounted in 100mm x 50mm or 100mm x 100mm by 35mm deep extension boxes.

Industrial Surface-mounted Switches

The box and cover plate shall be constructed of steel fitting together to make a dustproof assembly, IP44 to IEC Publication 162. The switch toggle or rocker shall be shrouded where it protrudes through the cover plate.

Where required, dustproof industrial surface-mounted switches shall incorporate hinged and sprung dust-proof flaps over the switches.

Hose-proof Switches

Switches designated hose-proof, weather-proof or waterproof shall be of non-metallic construction and hose-proof to IPW65 of IEC Publication 162. Operation may be rotary, or rocker through a membrane.

Ceiling Switches

Ceiling switches shall be rated for 250V 10A amp shall be installed on a round conduit box. The base shall be bakelite and the cover of bakelite with a brass screw ring insert.

Provide a 1,25m length of nylon cord.

Socket Outlets

General

Socket outlets shall comply with SANS 164,SANS10142-1: 2017 and bear the SANS mark or with SANS 1239 and IEC 309 as applicable. All socket outlets shall be earth leakage protected. Submit samples to the Engineer for approval.

Unless otherwise specified, socket outlets shall be rated for 250V (phase to neutral) 16A, shall be switched and have safety shutters on the phase and neutral contact tubes.

Where indicating lights are specified they shall form an integral part of the socket outlet and shall have neon lamps or light-emitting diodes.

Install socket outlets with the centres at the following heights above finished floor level unless otherwise noted:-

(a) generally unless otherwise specified : 300mm

(b) hospitals, clinics etc. : 450mm

c) kitchens, laboratories, industrial areas, plant rooms and over work tops : 1 200mm Socket outlets shall be finished as scheduled.

Metallic socket outlet plates shall be secured with two countersunk chromium-plated screws. Non-metallic plates shall be secured with two countersunk nylon screws.

Flush Single-phase Socket Outlets (16 A)

Flush single phase socket outlets shall be rated for 250V 16A and incorporate three contact tubes. They shall be mounted in 100mm x 100mm conduit boxes.

Surface-mounted Flush-pattern Single-phase Socket Outlets

Where flush-pattern single-phase socket outlets are to be mounted on the surface they shall be mounted in 100mm x 50mm or 100mm x 100mm extension boxes.

Industrial Surface-mounted Single-phase Socket Outlets

The box and cover plate shall be constructed of steel fitting together to make a dust-proof assembly, IP44 to IEC Publication 162. The switch toggle or rocker shall be shrouded where it protrudes through the cover plate. Where required, dust-proof industrial surface-mounted socket outlets shall incorporate hinged and sprung dust proof flaps over the switches and contact tubes.

Moulded Case Circuit Breaker Single-phase Socket Outlets

These socket outlets shall comprise a miniature moulded case circuit breaker and a 250V, 16A 3- contact tube socket outlet mounted in a standard 100mm x 100mm box. The miniature MCCB shall be Heinemann AM1-21, or approved alternative and shall be rated at 10A unless otherwise noted. The assembly shall be Hain catalogue reference SGNY-lO or approved alternative.

Hose-proof Socket Outlets

Socket outlets designated hose-proof, weather-proof or water-proof shall be hose-proof to IPW65 of IEC Publication 162 when the plug is removed and with the plug inserted.

Three-phase Socket Outlets

Three-phase socket outlets shall be of the CEE 17, 400V, 6h pattern with 5 contact tubes for three-phases, neutral and earth. Each outlet shall incorporate a switch which can only operate with the plug inserted. Unless otherwise specified, the outlets shall be rated at 16A.

Stove Connectors

Stove connectors shall be rated for 400/230V, 15A with four contact tubes for three-phases and neutral. Earth continuity shall be provided through the metallic casing of the socket outlet to the metallic casing of the plug by means of a screwing ring.

Stove connectors shall comply with the Appendix referred to in Regulation 707 (13) of the Standard Regulations for the Wiring of Premises.

5A Single-phase Socket Outlets

5A single-phase socket outlets shall be unswitched, rated for 250V, and have 3 contact tubes with shuttered live and neutral tubes. The socket outlets may be mounted in pre-punched trunking, 63mm dia., 100mm x 50mm or 100mm x 100mm conduit boxes.
Shaver Socket Outlets

Shaver socket outlets shall comply with BS 3052 and shall incorporate a double-wound isolating transformer rated at least 20VA and providing 115V and 230V.

The socket contacts shall be suitable for 115V North American pattern plug tops and 230V European pattern plug tops. Insertion of a plug top shall switch on the transformer primary and removal of the plug top shall switch it off.

Overload protection shall be included.

13A Single-phase Socket Outlets

13A single-phase socket outlets shall comply with SANS 1363.

Isolators (Switch Disconnectors) For Building Services Applications

Isolators shall comprise air-break switch disconnectors complying with SANS 152-1977, be double-pole for single-phase circuits and triple-pole for three-phase circuits, and be rated for 433/250V.

The current rating shall be 63A unless otherwise specified.

Isolators for single-phase appliances with loads less than 2,5kVA may have current ratings of 13A.

Where the final connection from the isolator comprises a flexible cord, the isolator assembly shall incorporate an indicating light, a grommet and cord grip or a compression gland, and a fuse rated to protect the cord.

Metallic cover plates shall be secured with two countersunk chromium-plated screws and non-metallic cover plates with two countersunk nylon screws.

The isolators shall be finished as scheduled.

Where indicating lights are specified they shall form an integral part of the isolator assembly and shall have neon lamps or light-emitting diodes.

Isolators up to 63A current rating shall be installed in 100mm x 100mm conduit boxes.

E2.2.4.27 LUMINAIRES

Provide all luminaires listed in the Schedule and shown on the Drawings including procurement, delivery, acceptance, storage, installation, aiming, adjustment, testing and commissioning.

Luminaires shall be installed complete with mounting accessories, brackets, poles, stirrups, baseplates etc.

Excavate, backfill and consolidate as necessary for luminaires.

Luminaires shall include lamps, indicator lamps, control gear, power factor correction equipment, electro-magnetic interference suppression equipment and all other accessories necessary to render the luminaires fully operative.

Luminaires shall not emit electro-magnetic or radio/television interference in excess of the limitations stipulated by the Department/Engineer of Posts and Telecommunications.

Luminaires shall have internal wiring of copper conductors of not less than 0,5mm², with suitable heat-resistant wiring to SANS 529. PVC insulated wire shall not enter luminaires with polycarbonate components. A terminal block shall be fitted to each luminaire. Luminaires shall each have an earth terminal and shall be bonded to earth.

Each luminaire shall be labelled next to the lamp holder and on the control gear with the following information: -

a) voltage rating;
b) lamp type
c) lamp wattage (for incandescent lamps, the maximum wattage).

Control gear shall be power factor corrected to at least 0,9 lagging, shall have a circuit efficiency of not less than 0,85 and shall be silent in operation.

Capacitors shall comply with SANS 1250:1979.

On request of the Engineer, submit luminaire details (including photometric data, and noise level reports) prepared by an accredited laboratory.

On request of the Engineer, remove any luminaire from site and submit luminaire to tests required by Engineer.

Luminaires shall be designed and installed to avoid excessive temperatures. Components and materials shall be so selected that they are not adversely affected by the operating temperature.

The harmonic distortion of a lamp circuit shall not exceed 30%.

Installation

Refer to Section: "Fixing of Materials" of this Specification.

Install luminaires in accordance with the manufacturer's recommendations.

Mount luminaires after the first coat of paint has been applied. Await final coat of paint, before completing installation of luminaires.

Fix luminaires equal to or narrower than 225mm at the centre and two outer positions. Fix luminaires wider than 225mm at the centre and at the four corners.

Where luminaires butt, fix them together with brass bushes and lock nuts.

Screw conduits directly to exterior luminaires and to luminaires with a degree of
protection in excess of IP44. Provide gasketting and sealants between luminaires and surface to which they are mounted. For wall-mounted luminaires, the conduit shall enter the luminaire at a slight downward angle to the horizontal.

Where luminaires are mounted on, or in, ceilings made of panels, mount the luminaires symmetrically. Where the mass of the luminaires exceeds the load carrying capability of the ceiling systems, install suitable hangers.

Connections to luminaires mounted on or in ceilings shall comprise metallic conduit, flexible conduit (without a PVC sheath), or silicone rubber flexible cord. Co-ordinate such connections with the Contractors installing the ceiling, air conditioning and other services.

Exterior Luminaires

Exterior luminaires shall have a degree of protection of at least IP65 of IEC-162. Lenses shall be resistant to degradation and discolouration from ultra-violet radiation. Materials shall be corrosion-resistant and selected to avoid electrolytic corrosion. Luminaires constructed of sheet steel or sheet aluminium are not acceptable.

The bodies shall be painted cast-iron; painted, or anodised (Class C), die-cast LM6 aluminium; glass-reinforced polyester; or polycarbonate.

Gaskets shall be silicone rubber or neoprene.

Lenses shall be polycarbonate or heat-resistant glass. Lens, or lens-frame, securing screws shall be stainless steel.

Floodlight luminaires shall incorporate calibrated horizontal and vertical angle scales.

Emergency and Standby Luminaires

Emergency Fluorescent Luminaires (with integral battery)

Each emergency fluorescent luminaire with integral battery shall incorporate a mains-failure relay, battery charger, nickel cadmium battery, and inverter which shall provide emergency lighting by means of one lamp operating at 100% light output for at least one hour. The battery charger shall fully recharge the batteries within 24 hours.

Mercury Vapour Luminaires on Emergency and Standby Circuits

Each mercury vapour luminaire on an emergency or standby circuit shall incorporate a mains failure relay, change-over switchgear, a photo switch and quartz halogen lamp. The quartz halogen lamp shall operate on mains failure until the mercury vapour lamp has run up when the photoswitch shall extinguish the quartz-halogen lamp.

High-pressure Sodium Luminaires on Emergency and Standby Circuits

Each high-pressure sodium luminaire on an emergency or standby circuit shall have a lamp with a run up time of not less than 20 seconds.

Exit Signs

Each exit sign with integral battery shall incorporate two fluorescent lamps each with its own separate control gear, mains failure relay, battery charger, nickel cadmium battery and inverter which shall provide emergency lighting by means of one lamp operating at 100% light output for at least one hour. The battery charger shall fully recharge the batteries within 24 hours.

Exit sign lettering shall be at least 150mm high.

Exit signs shall comply with BS 5266 and BS 2560. Surface-mounted exit signs shall incorporate an aperture of at least 200mm x 50mm with prismatic diffuser to provide downward light.

Fluorescent Luminaires

General

Interior fluorescent luminaires shall comply with SANS 1119:1976.

Construction

Provide three 20mm diameter knockouts in the backplate, one in the centre andone at each end. Each knockout shall have accompanying slots for screws to fit a standard round conduit box and arranged so that the luminaire can be turned through an angle of 90°C. The backplate shall extend the entire length of the luminaire. Luminaires shall be so constructed that it is possible to reach the control gear without disconnecting any wiring and without removing the luminaire from its installed position.

Channel Luminaires

Fluorescent channel luminaires shall consist of a ventilated rectangular wiring channel.

Lenses. Diffusers and Louvres

Lenses, diffusers and louvres shall be sufficiently strong and rigid to resist distortion and breakage during normal operation and maintenance.

Lenses, diffusers and louvres shall be constructed of:

a) flame-retardant acrylic (methacrylate),
b) flame-retardant, UV and light stabilised polystyrene, or
c) UV and light stabilised polycarbonate.

Components

Ballasts shall comply with SANS 890:1967. Unless otherwise specified ballasts shall be switch-start. Switch-start ballasts shall be wound length-wise around pre-assembled laminations crimped into a steel channel. No compound shall be required.

Starters shall comply with BS 3772/IEC-55 and be accessible for replacement with the lamps in position.

Lamp holders shall be telescopic or hinged sprung-ratchet.

Lamps

Lamps shall comply with SANS 1041:1975. Lamps shall have an average life of at least 7 500 hours on a 3 hour on/off switching cycle. On request submit to the Engineer the light output of the lamps at 100 hours and 2000 hours. The light output at 2 000 hours shall not be less than 80% of the output at 100 hours.

No lamp flicker of lamps shall be visible under normal operation after initial stabilisation period of 100 hours. Lamp colour shall be SANS colour reference 2 unless otherwise specified. 18W, 36W, and 58W fluorescent lamps (26mm diameter) shall be "colour 84" unless otherwise specified.

Incandescent Luminaires

Lamp holders shall be porcelain.

Lamp holders for lamps of 150W and higher rating shall be Edison Screw (E.S.).

The operating temperature within the luminaires shall be limited to avoid any adverse effects on any components.

Gas-Discharge Luminaires

Ballasts shall comply with SANS 1266:1979. Ballasts shall be cast in epoxy-resin and provided with heat sinks, cooling fins, etc., to limit the operating temperature to avoid any adverse affects to any components.

Interior luminaires shall comply with SANS 1278:1980.

Mercury vapour lamps shall be of the colour corrected, high pressure, fluorescent type.

High pressure sodium vapour lamps shall be of the colour enhanced type.

E2.2.4.28 ENERGISING LV ELECTRICAL MOTORS

Before energising any of the motors, for the purpose of commissioning, the Contractor shall measure the insulation resistance of each motor between phases and to casings by means of a 500 Volt "Megger" instrument, and the values shall be recorded and forwarded to the Engineer for information. If any of the readings for a particular motor are lower than 1,5 megohms, that motor shall not be energised until it has been dried out by the Contractor by a method to the Engineer's prior approval. Unless the lowest of the insulation resistance measurements on that motor exceeds 1,5 megohms, the motor shall not be energised.

The method adopted for drying-out shall be by applying heat, preferably by circulating current through the windings or, alternatively, by means of space heaters located in and around the machine.

Insulation resistance measurements and temperature readings shall be taken regularly every half hour at the start of dry-out until the motor attains an even temperature and thereafter every hour. The characteristic dry-out curve of insulation resistance versus temperature shall be plotted and dry-out may be considered complete four hours after the resistance readings have started to rise from the steady minimum value, providing that the winding temperatures have remained steady during this period.

All equipment and the personnel required for the drying-out operation, shall be provided by the Contractor. The onus remains on the Contractor to satisfy himself that a motor is dry before it is connected to the supply. Any motor which fails as a result of being commissioned in a damp condition, shall be repaired free of charge by the Contractor.

ANNEXURE A TECHNICAL DATA SHEETS AND PARTICULARS

FOR EACH LISTED ITEM THE CONTRACTOR WILL GIVE THE FOLLOWING DATA

ELECTRICAL EQUIPMENT OFFERED

Item	Offered
1.1) Motor Control Centre Steel-work	
Manufacture	
Is the form of Internal Separation 3b, 4a or 4b State?	
MCC Raw Water	
IP rating doors closed	
MCC Filtration	
Type tested or partially type tested to SANS IEC 60439? All supporting certificated of compliance to be supplied with tender	
1.2) Moulded case circuit breakers	
Manufacturer	
Type/model	
In accordance with specification	
1.3) HRS fuse links	
Manufacturer	
Type/model/rating	
In accordance with specification	
1.4) Contactors	
Manufacturer	
Type/model	
In accordance with specification	
1.5) Selector switches	
Manufacturer	
Type/model	
In accordance with specification	
1.6) Pushbuttons	
Manufacturer	
Type/model	
In accordance with specification	
1.7) Relays	
Manufacturer	
Type/model	
In accordance with specification	
Item	**Offered**

1.8) Indicator lights	
Manufacturer	
Type/model	
In accordance with specification	
1.9) Earth leakage relays	
Manufacturer	
Type/model	
In accordance with specification	
1.10) Programmable logic controllers (PLC)	
Manufacturer	
Type/model	
Maximum number of racks	
Program memory non-volatile?	
I/O capacity (digital)	
I/O capacity (analog)	
Communication protocol	
In accordance with specification	
1.11) Emergency stop buttons	
Manufacturer	
Type/model	
In accordance with specification	
1.12) Surge Arrestors	
Manufacturer	
Type/model	
In accordance with specification	
1.13) Soft Starters	
Manufacturer	
Type/model	
Rated current	
Max No. Starts / h	
CLASS	
Control supply voltage [V]	
Type of terminals	
Rated operational voltage(V)	
Number of starts per hour	
Starting voltage	
Ramp-up time	
Relative starting current limit	
Rated operational current (Ie)	
Optional line contactor	
Motor overload protection	
Thermistor motor protection	
Device overload protection	
Motor heating	

Communication module	
Integrated display	
HMI type	
All supporting technical literature to be supplied with tender	
1.14) DC power supplies	
Manufacturer	
Type/model	
In accordance with specification	
Item	**Offered**
1.15) Panel extraction fans	
Manufacturer	
Type/model	
In accordance with specification	
1.16) Conduit	
Manufacturer	
Type	
In accordance with specification	
1.17) Light switches	
Manufacturer	
Type	
In accordance with specification	
1.18) Switch Socket outlets	
Manufacturer	
Type	
In accordance with specification	
1.19) Luminaries	
1.19.1 Type A	
Manufacturer	
Type	
In accordance with specification	
1.19.1 Type B	
Manufacturer	
Type	
In accordance with specification	
1.19.1 Type C	
Manufacturer	
Type	
In accordance with specification	

1.19.1 Type D	
Manufacturer	
Type	
In accordance with specification	
1.20) L.V. armoured cables	
Manufacturer	
Type	
SANS approved	
In accordance with specification	
1.21) Multicore cables	
Manufacturer	
Type	
SANS approved	
In accordance with specification	
1.22) Float switches	
Manufacturer	
Type	
In accordance with specification	
1.23) Cable tray	
Manufacturer	
Type	
Material	
In accordance with specification	
Item	**Offered**
1.24) Telemetry Equipment (if the provided space is not enough attach manufactures spec)	
1.24.1 Remote Terminal Unit (RTU)	
Manufacture	
Model number	
Communication	
Features	
Analog Inputs (AIN)	
Digital Inputs (DIN)	
Digital Outputs (DOT)	
Data Reporting	
Other Specifications	
1.24.2 Digital Input Surge Protector	

Manufacture	
Model Number	
Features	
Supply Voltage DC	
Physical Dimension	
Connection Sockets	
Protection	
Channel (I/O)	
1.24.3 Power Supply	
Manufacture	
Model Number	
DC supply	
AC supply	
Battery supply	
Battery	
Rated Power	
Protection	
1.24.4 Data Radio	
Manufacture	
Model Number	
Transmission Power	
Working Frequency	
Power Consumption	
Receiver Sensitivity	
Working Temperature	
Output/ Input Interface	
Power control	

Circuit Structure	
High Anti-Interference and Low BER (Bit error Rate)	

PORTION 3

SPECIALIST WORKS

INDOOR GENERATOR SPECIFICATION

TAFALOFEFE HOSPITAL – WATER AND WASTEWATER TREATMENT WORKS

SCMU5-24/25-0037

Portion 3.1: Electronic Surveillance Specification
Portion 3.2: Electrical Specification
Portion 3.3: Indoor Generator Set Specification(**This document**)

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SECTION 1 – GENERAL

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1. SECTION 1 – GENERAL

1.1. Intent of Specification

The specification is intended to cover the complete installation and commissioning of the generator plant. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the contractor.

For the purposes of this document the following applies:

- Generator Contractor shall be referred to as the Generator Contractor or simply Contractor;
- The masculine includes the feminine;
- The singular includes the plural.

1.2. Standards and Codes

All standards referenced shall be the latest editions.

SANS 10142-1	the wiring of premises: Low Voltage Installations
SANS 8528	Reciprocating internal combustion engine driven alternating current generating sets.
SANS 60034	Rotating electrical Machines
SANS IEC 60947	Low Voltage Switchgear
OHSACT	Occupational Health and Safety Act.

Department of Public Works Quality Specification Parts A, B and C.
Local municipality by-laws for generator installations. (To be obtained from local municipality)

1.3. Compliance with Regulations

The installation shall be erected and tested in accordance with the following Acts and regulations:

a) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,
b) 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,
c) The Fire Brigade services Act 1987 (Act 99 of 1987) as amended,
d) The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as emended,
e) The Electricity Act 1984 (Act 41 of 1984) as amended.
f) The environmental Act and regulations

1.4. Scope of Work

Included in this indoor Generator Specification

Supply, delivery, installation and commissioning of the complete indoor emergency generator set specified in this document.

The plant room is readily available and the contractor shall ensure that the space allowed is sufficient for the installation of the generator set and that the ventilation of the plant room is adequate. If any changes to the design have to be made the contractor must inform the consulting engineer in writing.

1.5. Co-ordinating

The Contractor shall familiarise himself with the requirements of the other professional disciplines and shall examine the plans and specifications covering each of these sections.

The generator space, noise and vibration requirements shall be carefully checked with other professional disciplines to ensure that the equipment can be installed in the proper sequence in the space allotted.

1.6. Tests Certificates and Inspections

The following tests are to be carried out:

a) At the supplier's premises, before the generating set will be delivered to site Representatives of the Department must be present during the test to satisfy themselves that the generating set complies with the specification and delivers the specified output. The test must be carried out in accordance with SANS 8528. The Representative/Agent must be timeously advised of the date for the test.
b) After completion of the works and before practical completion is taken, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the contractor shall make good, to the satisfaction of the Representative/Agent, any defects which may arise.
c) The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.
d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Representative/Agent.

The total costs for these test shall be included in the tendered amount.

In the event of the plant, equipment or installation not passing the test, the Representative/Agent shall be at liberty to deduct from the Contract amount all reasonable expenses incurred by the Employer and/or the Representative/Agent attending the test.

1.7. Operating and Maintenance Manuals

The Contractor shall be responsible for the compilation of a complete set of Operating and Maintenance manuals.

This shall be done in accordance with Section 4 – Operating and Maintenance manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Representative/Agent with three sets of hard copies.

Approval of the final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Practical Completion of the installation.

1.8. Guarantee

After works completion of the installation have been achieved, there will follow a 12-month free maintenance period.

During this period the generator contractor shall maintain the generator installation as per the requirements of the Occupational Health and Safety Act. This maintenance shall include systematic examinations, adjustments and lubrication of all generator equipment. Electrical and mechanical parts shall be repaired or replaced whenever it is required to maintain optimum performance without additional cost to the Department, unless the condition was caused by misuse or vandalism of the generator equipment or natural hazards/force majeure.

The work under this section shall be performed by competent, qualified accredited personnel under the supervision and in the direct employment of the Generator Contractor and shall not be transferred to any non-affiliated agent. Contract maintenance and repair work shall be done during normal working hours and shall further provide emergency call-back service twenty-four (24) hours a day, seven (7) days a week.

During the guarantee/maintenance period the Department will invite tenders for the comprehensive maintenance of the generator, which will commence after the final completion has taken place, i.e. after the twelfth month guarantee period is over and all defects are corrected.

1.9. Materials and Workmanship

a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Representative/Agent who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Representative/Agent.
b) All work shall be executed in a first-class manner by qualified accredited tradesman.
c) The Contractor shall be fully responsible for his work and shall replace any of the work which may be damaged, lost or stolen. The Contractor shall protect the building and its contents against damage by him, his employees or sub-contractors and shall make good any damage thereto.
d) The Contractor shall indemnify the Employer of all liability for damages arising from injuries or disabilities to persons or damage to property occasioned by any act or omission of the Contractor or any of his sub-contractors, including any and all expenses, legal or otherwise, which may be incurred by the Employer or Representative/Agent in the defence of any claim, action or suit.
e) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.
f) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation and commissioning work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.
g) The Contractor shall inspect and verify that the existing power feeder system is compatible with the equipment offered and any changes or upgrading of the electrical supply shall be brought to the attention of the Representative/Agent.
h) Material and equipment damaged in transit shall be replaced with undamaged material without additional cost to the Department.
i) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor’s scope of works.
j) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.
k) The Contractor shall make sure that all safety regulations and measures and environmental regulations are applied and enforced during the installation and guarantee period to ensure the safety of the public and the User Client.

1.10. Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents.

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2. SECTION 2 – EQUIPMENT REQUIREMENTS

2.1. Engine

2.1.1. General

The engine must comply with the requirements laid down in SANS 8528 and must be of the atomized injection, compression ignition type, running at a speed not exceeding 1500 r.p.m. The engine must be amply rated for the required electrical output of the set, when running under the site conditions. The starting period for either manual or automatic switching-on until the taking over by the generating set, in one step, of a load equal to the specified site electrical output, shall not exceed 15 seconds. This must be guaranteed by the Tenderer.

Turbo-charged engines will only be accepted if the Tenderer submits a written guarantee that the engine can deliver full load within the specified starting period.

Curves furnished by the engine makers, showing the output of the engine offered against the speed, for both intermittent and continuous operation as well a fuel consumption curves when the engine is used for electric generation, must be submitted with the Tender.

2.1.2. Rating

The set shall be capable of delivering the specified output continuously under the site Conditions, without overheating. The engine shall be capable of delivering an output of 110% of the specified output for one hour in any period of 12 hours consecutive running in accordance with SANS 8528.

2.1.3. De-Rating

The engine must be de-rated for the site conditions as set out in the Technical Specification, Section 3 of this document.

The de-rating of the engine for site conditions shall be strictly in accordance with SANS 8528 as amended to date. Any other methods of de-rating must have the approval of the Department and must be motivated in detail. Such de-rating must be guaranteed in writing and proved by the successful Tenderer at the site test.

2.1.4. Starting and Stopping

The engine shall be fitted with an electric starter motor and be easily started from cold, without the use of any special ignition devices under summer as well as winter conditions.

Tenderers must state what arrangements are provided to ensure easy starting in cold weather. Full details of this equipment must be submitted. In the case of water cooled engines, any electrical heaters shall be thermostatically controlled. The electrical circuit for such heaters shall be taken from the control panel, and must be protected by a suitable circuit breaker.

2.1.5. Starter Battery

The set must be supplied a fully charged lead-acid type or maintenance free type battery, complete with necessary electrolyte. The battery must have sufficient capacity to provide the starting torque stipulated by the engine manufacturer. The battery capacity shall not be less than 120 Ah and shall be capable of providing three consecutive start attempts from cold and thereafter a fourth attempt under manual control of not less than 20 seconds duration each. The battery must be of the heavy duty “low maintenance” type, house in a suitable battery box.

2.1.6. Cooling

The engine may be either of the air or water cooled type. In the case of water-cooling, a built-on heavy duty, tropical type pressurised radiator must be fitted. Only stand-by sets that are water cooled shall have electric heaters.

For either method of cooling, protection must be provided against running at excessive temperatures. The operation of this protective device must give a visual and audible indication on the switchboard. Water-cooled engines shall in addition be fitted with a low water cut-out switch, installed in the radiator, to switch the set off in the event of a loss of coolant. The protection shall operate in the same way as the other cut-outs (e.g. low oil pressure). All air ducts for the cooling of the engine are to be allowed for. The air shall be supplied from the cooling fan cowling/radiator face to air outlet louvers in the plant room wall.

2.1.7. Lubrication

Lubrication of the main bearings and other important moving parts shall be by forced feed system. An automatic low oil pressure cut-out must be fitted, operating the stop solenoid on the engine and giving a visible and audible indication on the switchboard.

2.1.8. Fuel Pump

The fuel injection equipment is suitable for operation with the commercial brands of diesel fuel normally available in South Africa.

2.1.9. Fuel Tank

A fuel tank shall be installed in the plant room. The fuel tank shall be a free standing type or alternatively be an integral part of the base frame of the generator set. The tank shall have sufficient capacity for standby sets to run the engine on full load for a period of 24 hours.

The diesel fuel storage system / tank which will be provided with the standby generator installation must be fitted with a fuel filtration and water separation system (filter & separator) which is entirely separate from the fuel supply line and line filter to the engine. This filtration and water separation system must be dedicated to purifying the content of the storage system / tank by way of the cleaning processes which are applied while circulating the fuel through the filter & separator unit.

The filtration system must be able to handle diesel fuel of “high” and of “low” sulphur content for an indefinite period. The suction line of the system must be connected to the lowest part of the storage system / tank. The return line must be connected in the top section of the storage system / tank in such a position and in such a way that the flow of fuel within the storage system / tank between the fuel return point and the fuel suction point will induce scouring of the bottom of the system / tank to effectively capture sediment and water in the to be filtered fuel.

The filtration unit must filter the diesel fuel, removing suspended particles of effective diameters down to 5 micron. In addition, it must separate all water from the fuel and the fuel storage system and automatically dispose of / dump such water into an open, removable receptacle for disposal at the installation or in a suitable position outside the building. Separation of the fuel and water must be sufficiently effective that the discharged water will meet the standard required for it to be disposed of into a municipal drain and sewer system.

The filter and water separator unit must draw its power from the DC batteries used to power the relevant generator set. The circulating pump shall be provided with a controller programmed to switch the pump through not more than three complete on and off cycles of equal time (i.e. 50% on; 50% off) , per hour, with a deviation of not more than 10 % ±. The pump must be capable of a duty cycle of not less than 60% running time. The flow rate through the circulating pump must be between 1 L/min and 1.25 L /min.

The filter cartridge of the filter and water separator unit must be replaceable, and, in normal operational conditions, not require replacement within periods shorter than three months. The replacement units must be readily available.

The filtration & separator system may be mounted against the wall of the plant room or on the inside of a container, which may house the installation as may be specified elsewhere in this document.

The tank shall be fitted with a suitable filter, a full height gauge glass, “low fuel level” alarm, giving an audible and visible signal on the switchboard as well as a low-low fuel level cut-out.

An electrically operated pump with sufficient length of oil resistant hose to reach 2m beyond the door, shall be supplied, for each set for filling the fuel tank/s from 200 litre drums.

The interconnection fuel piping shall consist of copper tubes and the connection to vibrating components shall be in flexible tubing with armoured covering.

2.1.10. Governor

The speed of the engine shall be controlled by a governor in accordance with ECM of SANS 8528 if not otherwise specified in the Detailed Specification.
The permanent speed variation between no load and full load shall not exceed 4.5% of the nominal engine speed and the temporary speed variation shall not exceed 10%. External facilities must be provided on the engine, to adjust the nominal speed setting by ± 5% at all loads between zero and rated load.

2.1.11. Flywheel

A suitable flywheel must be fitted, so that lights fed from the set will be free from any visible flicker.

The cyclic irregularity of the set must be within the limit laid down in SANS 8528.

2.1.12. Exhaust Silencer

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of the residential type must be provided and shall be capable of providing 20 to 30 decibels of suppression.

The exhaust system shall consist of 3CR12 steel for inland areas (greater than 50km from the coast) or Grade 304 stainless steel in coastal areas.

The exhaust pipe shall be installed in such a way that the expulsed exhaust fumes will not cause discomfort to the public. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage. The exhaust piping and silencer shall be lagged and then cladded in stainless steel sheet to reduce the heat and noise transmission into the plant room and shall be protected against the ingress of driving rain at 45° to the horizontal. The exhaust pipe must extend 0,5m above the roof gutters or higher to avoid pollution of gas emissions into other buildings/offices. It must be secured by stainless steel flanges both sides of the wall at the point of exit. These flanges must be clamped to the wall with bolts through the wall.

2.1.13. Accessories

The engine must be supplied complete with all accessories, air and oil filters, 3 instruction manuals, spare parts lists, the first fill of all lubricating oils, fuel, etc.

2.1.14. Exhaust emissions

The exhaust emissions shall comply with US Tier III/EU stage III standards.

2.2. Alternator

2.2.1. General

The alternator shall be of the self-excited brushless type, with enclosed ventilated drip-proof housing and must be capable of supplying the specified output continuously with a temperature rise not exceeding the limits laid down in SANS 60034-1 for rotor and stator windings.

The alternator shall be capable of delivering an output of 110% of the specified output, for one hour in any period of 12 hours consecutive running.

Both windings must be fully impregnated for tropical climate and must have an oil resisting finishing varnish.

2.2.2. Regulation

The alternator must preferably be self-regulated without the utilisation of solid state elements. The inherent voltage regulation must not exceed plus or minus 5% of the nominal voltage specified, at all loads with the power factor between unity and 0,9 lagging and within the driving speed variations of 4,5% between no-load and full load.

2.2.3. Performance

The excitation system shall be designed to promote rapid voltage recovery following the sudden application of the load. The voltage shall recover to within 5% of the steady state within 300 milli-seconds following the application of full load and the transient voltage dip shall not exceed 18%.

2.2.4. Coupling

The engine and alternator must be directly coupled by means of a high quality flexible coupling, ISO 9001:2000 approved and must be designed and manufactured to this quality system.

2.3. Switchboard

2.3.1. General

A switchboard must be supplied and installed to incorporate the equipment for the control and protection of the generating set and battery charging.

The switchboard must conform the specification as set out in the following paragraphs.

2.3.2. Construction

The switchboard shall be a totally enclosed, floor mounted unit, fabricated from steel panels, carried on and-substantial angle iron framework.

The board shall be flush fronted and all equipment to be mounted behind the front plate, on suitable supports.

All equipment, connections and terminals shall be easily accessible from the front. The front panels may be either hinged or removable and fixed with studs and chromium-plated cap nuts. Self-tapping screws shall not be used in the construction of the board.

All pushbuttons, pilot lights, control switches, instrument and control fuses, shall be mounted on hinged panels with the control wires in flexible looms.

The steelwork of the boards must be thoroughly de-rusted, primed with zinc chromate and finished with two coats of signal red quality enamel, or a baked powder epoxy coating.

Suitably rated terminals must be provided for all main circuits and the control and protection circuits. Where cable lugs are used, these shall be crimped onto the cable strands. Screw terminals shall be of the type to prevent spreading of cable strands. All terminals shall be clearly marked.

For the control wiring, each wire shall be fitted with a cable or wire marker of approved type, and numbering of these markers must be shown on the wiring diagram on the switchboard. Control wiring shall be run in PVC trunking. The trunking shall be properly fixed to the switchboard steelwork. Adhesives shall not be acceptable for the fixing of trunking or looms.

The modular generator set controller and protection equipment shall be mounted on a separate easily replaceable panel.

All equipment on the switchboard, such as contactors, isolators, busbars, etc., shall have ample current carrying capacity to handle at least 110% of the alternator full load current.

Access to the cubicle will be such that all components can be conveniently reached for testing and maintenance purposes.

The necessary bushes and a screen over the terminals will be provided where the power feeds enter and leave the cubicle.

The cubicle will be so constructed that the ac and dc components are screened from one another.

2.3.3. Protection and Alarm Devices

All switchboards shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed for protection of the alternator. The protection relay shall be of the type with inverse time characteristics. The relay shall cause contactor to isolate the alternator and stop the engine.

Protection must be provided for overload, high engine temperature, low lubricating oil pressure, over speed, start-failure, and low water level.

Reset push buttons are required on the modular generator set controller and a visible signal are required and the engine must stop when any of the protective devices operate. In the case of manual operation of standby sets, it shall not be possible to restart the engine.

The indication on the modular generator set controller must be in ENGLISH.

"OVERLOAD"
"TEMPERATURE HIGH"
"OIL PRESSURE LOW"
"OVERSPEED"
"START FAILURE"
"LOW WATER LEVEL"

In addition an audible and visible flashing signal shall be provided, when:

a) The fuel level in the service tank is low. The indication on the modular generator set controller shall be "FUEL LOW".
b) The battery charger failed. The indication on the modular generator set controller shall be “CHARGER FAIL”

A low-low level sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

This is also applicable to the engine driven generator/alternator.

All alarm conditions must operate an alarm hooter. A pushbutton must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified.

An on/off switch is not acceptable. After the hooter has been stopped, it must be re-set automatically, ready for a further alarm.

The hooter must be of the continuous duty and low consumption type. Both hooter and protection circuits must operate from the battery.

Potential free contacts from the alarm relay must be brought down to terminals for remote indication of alarm conditions.

A test pushbutton must be provided to test all indicators lamps.

2.3.4. Modular Generator Set controller

The modular generator set controller shall be an electronic unit to match those of the other modular generator set controllers and of a high quality i.e. Levato, Deep Sea Electronics, Circom. It must be provided with IO and communication facilities.

The modular generator set controller will be supplied with all its functions and shall be mounted on a separate easily replaceable panel with plug in termination blocks for easy installation and replacement.

The modular generator set controller interface will be implemented with relays, contractors etc.

The modular generator set controller will have a mimic display of the alternator/mains/ change over contactors configuration with LED's showing the status of the mains, alternator and change over contractors.

Configuration software shall be supplied with the system. The software will be capable of the following:

- Fault management (event log)
- Configuration management (software upgrades and function changes)
- Account management (energy management)
- Performance management (generator set point changes)
- Security management (passwords)

The modular generator set controller will have a standard RS 232/485 or Ethernet interface suitable for TCP I/P transport medium. All communication including configuration management will be done through this port. Equipment connected at each end of the RS 232 or Ethernet cable shall be adequately protected against transient over-voltages, lightning effects (particularly if the set and remote alarms are in separate buildings), switching surges, power system surges or mains and alternator borne noise/interference.

The controller will incorporate the following functions:

- Mains sensing
- Alternator output-voltage sensing
- Alternator over- frequency sensing
- Control of processor unit (self-diagnostics)
- Alarm/ Status indications
- Control selector and operation
- Phase rotation monitor

A 4- position control selector on the controller will be provided to facilitate the following modes of operation:

- OFF: Diesel/ alternator generator set switched off
- MANUAL: Mains bypassed: Diesel/ alternator will not take load
- AUTO: Diesel /alternator takes load on mains failure
- TEST: Diesel /alternator takes load on mains failure
- A standby failure alarm (SF) will be given on the controller and to the output alarms when “Not in Auto” is selected.

The modular generator set controller must monitor the following

When the voltage of the incoming mains varies by more than a pre-program value (default +- 10%) from the normal voltage on any phase, the controller will signal that the incoming mains will be disconnected and the engine-starting sequence initiated.

When the frequency of the incoming mains varies by more than pre- program value (default +-5%) from the normal frequency, the controller will signal that the incoming mains will be disconnected and the engine-starting sequence initiated.

Upon restoration of the incoming mains to the pre-program value (default +-10%) of the normal voltage on all phases, the monitor will signal that the load will be disconnected from the alternator and reconnected to the incoming mains.

If the alternator has been disconnected from the load and the incoming mains within the voltage limits of +- 10% on all phases, the controller will signal that the load will be reconnected to the incoming mains.

Should the incoming mains fail or not in the specified limits while the engine is running under control of the cooling-off timer, the control for the cooling –off timer in the controller will be cancelled and the load connected to the alternator.

When the output voltage of the alternator varies by more than the pre-program value (default value +- 10 %) on ANY phase, the controller will signal that the load will be disconnected from the alternator and the engine stopped.

A software over and under-frequency monitor will be provided in the controller if the frequency exceeds or drop below pre-programmed values. It will meet the requirements of class G2 governing. The monitor will not be influenced by harmonics.

Note: Software monitors will include adjustable overshoot and undershoot timers to be fully compatible with Class G2 governing.

All timers will be implemented in software.

Incoming supply failure timer
It is essential that incoming supply failures, occurring at short intervals, do not cause a series of starts and stops.
A timer adjustable from 1 s to 10 s required
The timer default value will be generator set to 3 s
The signal generated by the mains voltage monitor will start the timer. If the duration of the signal is less than the generator setting on the timer, the signal is suppressed to that the switching and starting sequence is initiated. However, if the duration of the signal is more than the generator setting on the timer, the signal will be transmitted to initiate the switching and starting sequence.

Incoming supply restoration timer
It is essential that incoming supply failures, occurring at short intervals, do not cause a series of starts and stops.
A timer adjustable from 1 s to 10 s required.
The timer default value will be generator set to 3 s.

The signal generated by the mains voltage monitor will start the timer. If the duration of the signal is less than 150 sec, the signal is suppressed and the timer is regenerator set. However, if the duration of the signal is more than 150 sec, the signal will be transmitted to initiate the switching sequence.

Alternator supply/ incoming supply change-over timer
It is essential that the supply be disconnected from the load before the incoming supply is reconnected to the load. This will be software generator settable in the controller with a minimum of 5 seconds and maximum of 20 seconds.
On receipt of the switching signal, the alternator supply will be disconnected from the load and timer started. After 5 sec, the incoming supply will be reconnected to the load.

Engine cooling-off timer
After the load has been transferred to the incoming supply the engine will run without load for a period to cool off and then stop.
A timer, software adjustable in the controller from 5 to 10 min is required.

Repeat- start control
A repeat- start control is required in the controller software adjustable so that in the event of the engine falling to start on the first start attempt, the starter motor will be released and repeat the start attempt.
The repeat-start attempt will be repeated 3 times.
The duration of each start attempt will be 6 sec with a period of 15 sec between successive start attempts.
Should the engine fail to start after the third start attempt, the controller will transmit a signal for alarm purposes.

In addition to the requirement for the switchboard instruments listed elsewhere in this document metering will also form part of the modular generator set controller and must be accessible on the software.

The modular generator set controller shall display the following alarm/status indications:

- High engine temperature.
- Low Oil pressure
- High/low alternator output voltage
- Over and under speed (frequency)
- Low water level
- Emergency stop activated
- Mains fail
- Battery charger fail
- Dummy load in operation (When provided)
- Unit not in Auto
- Engine running
- Low fuel alarm
- Engine start failure

Conditions one to six above will stop the engine.

The Contractor shall provide a remote alarm mimic panel and the associated control wiring for the set. The panel shall be installed in the duty/security room at the entrance to the building approximately 70m from the generator set position.

The mimic panels must fit into furniture and blend with the design. Before manufacture, the Contractor shall submit and obtain the approval, from the Engineer, for the mimic panel.

The remote alarm must have potential free relay contacts which shall indicate the following on each set:

1) Mains on/off
2) Alternator running

3) Common fault alarm
4) Buzzer which can only be reset at the generator panel
5) Fuel low

The cable between the remote alarms is to be a signal cable with a screen and this option must be able to operate from a 12 / 24 V dc supply so that it can be powered from the generator set batteries.

A facility to originate a fault message should a warning or shutdown fault occur.

A facility to allow the mode of the control system to be changed to any of the four modes to allow the set to be run from a remote location.

A facility to originate a call to the control cellular and to transfer a fault message should a warning or shutdown fault occur. The alarm conditions above from the controller will be extended to four relays with a make and break contact and terminal strip to allow for remote monitoring of the following alarms:

- Mains fail
- Standby run
- Standby fail
- Low Fuel

A remote start facility must be supplied, software controllable in the controller.

All events relating to the status of the generator set shall be logged with date and time in a non-volatile memory (which can retain information for a period of 6 months in the absence of power to the controller) and the user shall be able to contain a hard copy on site.

The modular generator set controller system must be able to operate with a minimum DC supply voltage of 4 volts (without making use of either an internal or an external auxiliary battery) to allow cranking and starting under conditions of low battery capacity. Control cables between the set and the control panel shall be fitted with sockets for ease of undoing in the event the modular generator set controller has to be removed.

2.3.5. Manual Starting

Each switchboard shall be equipped with two pushbuttons marked “START” and “STOP” for manual starting and stopping of the set.

2.3.6. Battery Charging Equipment

Each switchboard shall be equipped with battery charging equipment.

The charger shall operate automatically in accordance with the state of the battery and shall generally consist of an air-cooled transformer, a full wave solid state rectifier, and the necessary automatic control equipment of the constant voltage system.

The charger must be fed from the mains. An engine driven alternator must be provided for charging the battery while the set is operational. Failure of this alternator must also activate the battery charger failure circuit.

The starter battery voltage will be software monitored by the modular generator set controller. The voltage will be digitally displayed.

2.3.7. Switchboard Instruments

Each generating set shall have a switchboard equipped as follows:

a) One flush square dial voltmeter, reading the alternator voltage, scaled as follows:

(i) 0-300V for single phase generators.
(ii) 0-500V for three phase generator. In this case a six position and off selector switch must be installed for reading all phase and phase to neutral voltages.

b) A flush square dial combination maximum demand and instantaneous ampere meter for each phase, with resettable pointer suitably scaled 20% higher than the alternator rating. A red arc stripe above scale markings from 0-20A and a red radial line through the scale at full-load current, shall be provided. This instruments shall be supplied complete with the necessary current transformer.
c) One flush square dial vibrating type frequency meter, indicating the alternator frequency.
d) A six digit running hour meter with digital counter, reading the number of hours the plant has been operating. The smallest figure on this meter must read 1/10 hour.
e) Fuses or m.c.b.'s for the potential voltage circuits of the meters.
f) One flush square dial ampere meter suitably scaled for the battery charging current.
g) One flush square dial voltmeter with a spring loaded pushbutton or switch for the battery voltage.

2.3.8. Marking

All labels, markings or instructions on the switchgear shall be in English.

2.3.9. Earthing

An earth bar must be fitted in the switchboard, to which all non-current carrying metal parts shall be bonded.
The neutral point of the alternator must be solidly connected this bar by means of a removable link labelled "EARTH". Suitable terminals must be provided on the earth bar for connection of up to three earth conductors, which will be supplied and installed by the electrical contractor.

2.3.10. Operation Selector Switch

A four position selector switch must be provided on the switchboard marked "AUTO", "MANUAL", "and TEST" and "OFF".

With the selector on "AUTO", the set shall automatically start and stop, according to the mains supply being available or not.

With the selector on "TEST", it shall only be possible to start and stop the set with the pushbuttons, but the running set shall not be switched to the load.

With the selector on "MANUAL", the set must take the load when started with the pushbutton, but it must not be possible to switch the set on to the mains, or the mains onto the running set.

With the selector on "OFF", the set shall be completely disconnected from the automatic controls, for cleaning and maintenance of the engine.

2.3.11. Automatic Change-over System

A fully automatic change-over system must be provided to isolate the mains supply and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.
The contactors for this system must be electrically and mechanically interlocked.

2.3.12. By-pass Switch and Main Isolator

The switchboard shall be equipped with an on-load isolator to isolate the mains and a manually operated on-load 4 pole 4 position by-pass switch, which shall switch the connected loads as follows:

NORMAL: will allow for the normal connection i.e. connects the incoming mains to the Automatic control gear or directly to the outgoing feeder.
In the GEN BY-PASS position the switch will disconnect the automatic changeover control gear, and will connect the municipal mains directly the essential supply busbar which will allow for the maintenance of either or both the generator and the automatic changeover equipment.
MAINS BY-PASS switching position would allow the generator to be connected directly to the essential supply busbar. This is when there is a problem with the automatic changeover equipment and there is no municipal power available.
The final position is an OFF position which will remove all power downstream of this switch.

It is required that this by-pass switch and mains isolator be mounted away from the automatic control gear, in a separate compartment, either on the side or in the lower portion of the switchboard cubicle, and that the switches are operated from the front of the compartment.
Contractor to note: The by-pass and mains isolator switch shall also break the main neutral.

2.3.13. Start Delay

Starting shall be automatic in event of a mains failure. A 0-15 second adjustable start delay timer shall be provided to prevent start-up on power trips or very short interruptions.

2.3.14. Stop Delay

A stop delay with timer is required for the set, to keep the set on load for an adjustable period of one to sixty seconds after the return of the mains supply, before changing back to the supply. An additional timer shall keep the set running for a further adjustable cooling period of 5 to 10 minutes at no-load before stopping.

2.4. Installation

Except for the supply of the incoming mains cable and outgoing feeder cables, the tenderer must include for the complete installation and wiring of the plant in running order, including the connection of the incoming cable and outgoing feeder cables.

The connecting of the cable and control cabling to the generator and the control terminals in the LV board remains the responsibility of the tenderer.

2.5. Warning Notices

Notices, in English, must be installed at the entrance doors to and in the plant rooms.

The contents of these notices are summarised below.

a) Unauthorised entry prohibited.

b) Unauthorised handing of equipment prohibited.

c) Procedure in case of electric shock.

d) Procedure in case of fire.

e) Ear Protection required

The successful tenderer must consult the Occupational Health and Safety Act 83 of 1993 and get approval of the wording from the Department's representative, prior to ordering the notices.

Lettering must be black on a yellow background.

Notices (a) must be installed outside next to the entrance of the plant room and (b-d) inside the plant room.

In the plant room, a clearly legible and indelible warning notice must be mounted in a conspicuous position.

The motive shall be made of a non-corrodible and non-deteriorating material, preferable plastic, and must read as follows:

DANGER: This engine will start without notice. Turn selector switch on control board to "OFF" before working on the plant.

An engraved label shall be installed on the generator control panel that indicates the following:
Base Tank Capacity
Bulk Tank Capacity (if provided)
Full load litres per hour consumption

2.6. Construction

The engine and alternator of the set shall be built together on a common frame, which must be mounted on a skid base on anti-vibration mountings. The set must be placed direct on the concrete of the generator room. A drip tray must be fitted under the engine. The tray must be large enough to catch a drip from any part of the engine.

The frame must be of the 'DUPLEX' type.

2.7. Operation

The set is required to supply the lighting and power requirements in the case of a mains power failure.

The set shall be fully automatic i.e. it shall start when any one phase of the main supply fails or get switched and shall shut down when the normal supply is re-established. In addition it shall be possible to manually start and stop the set by means of pushbuttons on the switchboard.

The automatic control shall make provision for three consecutive starting attempts. Thereafter the set must be switched off, and the start failure relay on the switchboard must give a visible and audible indication of the fault.

To prevent the alternator being electrically connected to the mains supply when the mains supply is on and vice versa, a safe and fail proof system of suitably interlocked contactors shall be supplied and fitted to the changeover switchboard.

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3. SECTION 3 – TECHNICAL SPECIFICATION

3.1. General

Supply, deliver, install, commission, test and maintain an emergency generating set at Tafalofefe hospital

This installation must comply fully with all the sections and drawings of this document. This technical specification is supplementary to the Equipment Requirements, Section 2, and must be read together where they are at variance the Technical Specification shall apply.

The set must be installed in the plant room.

3.2. Site Information and Conditions

3.2.1. Location

The site is at Tafalofefe Hospital-Butterworth, Eastern Cape, South Africa. Tafalofefe hospital is ± 55 kilometres from Butterworth and ± 19 kilometres from Mazeppa Bay. It is situated within the administration area of Kabakazi location.

3.2.2. Site Conditions

The following site conditions will be applicable and equipment shall be suitably rated to develop their assigned rating and duty at these conditions.

a) Height above sea level : 1000 Meter
b) Maximum ambient temperature : Site specific
c) Maximum ambient humidity at lowest temperature : Site specific

3.3. Output and Voltage

After the de-rating factors for the engine and generator due to site conditions have been taken into account, the set must have a site output and voltage as follows: -

No load voltage	:	400/230 Volt
Rating	:	66kVA
Power at 0.8 power factor	:	53kW
Frequency	:	50Hz
Fault Level	:	5kA

The generating set is required to feed the following electrical motor loads on different starting methods.

3.4. Switchboard/Control Panel Unit

All switch- and control gear shall be rated for a fault current level of 5kA.

The switchboard/control panel unit shall be a free standing floor mounted type, which shall be installed in the plant room next to the existing switchboard. The figure 3.1 below shows the available space in the plant room for installation of new genset switchboard.



Figure 3.1: Existing switchboard

3.5. Cables

The contractor will be responsible for all electrical cable connections associated with the complete generating set installation.

The following cables will be supplied, installed and terminated at the Switchboard by the electrical contractor. Adequate provision shall be made for the termination of these cables at the Switchboard:

DB fed	PVC PVC SWA PVC Cable
Main switchboard	70 mm² 4 core cable

3.6. Engine

A sump drainpipe must be fitted with a shut-off valve placed in a convenient position outside the base frame to facilitate drainage.

Recommended oil types must be indicated on the engine, or base frames, by means of suitable labels.

All engine instruments shall have clear markings on the faceplates, indicating the normal operating zone(s), maximum and minimum allowable values/limits and danger zone(s).

The flywheel shall be covered by approved hoods.

3.7. Alternator

The Alternator shall be of the low harmonic type.

3.8. Load Acceptance

The generator set shall be capable of accepting 75% of the specified site electrical output 10 seconds after the starter motor is energised and the remaining 25%, 5 seconds thereafter, i.e. 100% load acceptance shall not exceed 15 seconds.

3.9. Generator Room

The site has an existing generator room with 250kVA generator set, the new shall be installed in the available space next to the existing genset. The available space shall be measured prior to manufacture to ensure the set will fit in the available space.

3.10. Alarms

The successful tenderer must pay particular attention to the requirements of the alarms as described in the Equipment Requirements, Section 2.

One alarm hooter and red light shall be supplied and installed on the outside wall of the generator room in the position as shown on the drawing in this specification.

The hooter shall consist of an electronic unit similar and equal to a “Klaxon” - type SY2/725 hooter with a continuously rated output and 110 dB at a distance of 2 metres, and shall be IP55 weatherproof rated.

The warning light shall consist of a 40W flashing red light, which shall be mounted on a galvanised steel frame together with the hooter.

The hooter and light shall be switched on or off simultaneously after initiation or cancellation of an alarm condition. The supply and installation of the wiring between the control board and the alarm unit forms part of this contract.

The successful tenderer must ensure that the hooter control circuit resets automatically after cancellation due to a low fuel condition or battery charger failure, but the visible fault indication must remain, i.e. should the operator continue to run the set, the hooter must sound, should any other condition develop.

A remote alarm panel shall be supplied and installed by the contractor in the control room. This shall be of surface mounting, enamelled sheet metal (colour to approval), minimum depth construction, and shall incorporate a flashing red pilot alarm light, adjustable electronic sounder, and a silence push button. The silence button shall not switch off the pilot light - this shall only be switched off when the alarm is reset at the Generator Panel.

A 2,5mm² x 4-core PVC SWA PVC cable will be supplied, installed and terminated by others between the Generator Panel and the Charge Office. The Contractor shall connect this cable at both ends and shall supply and install all switch gear relays, etc. to ensure satisfactory operation of the Remote Alarm Panel.

3.11. Remote Control Generator Switch

A Remote Control Generator “ON/OFF/AUTO” switch will be supplied and installed by others in the control room, and a 2,5mm² x 4-core PVC SWA PVC cable will be supplied and installed by others between the control room and the Generator Panel.

The contractor shall connect this cable at both ends, and shall supply and install all switch gear, relays, etc. to ensure satisfactory operation of the remote control switch.

3.12. Fuel Drip Tray

A drip tray approximately 100mm deep shall be mounted below the fuel tank and must be large enough to collect any fuel that drips from the tank accessories. The drip tray shall be manufactured from black mild steel. The thickness of the drip tray sheet steel shall not be less than 2mm.

3.13. Completion Time

The Generator Set is required to be commissioned in conjunction with the building contract.

3.14. Inform

The successful tenderer shall inform the Engineer when the set is ready for installation.

3.15. Fuel Supply Tank

The fuel tank shall be a free-standing type, which shall be installed in the plant room. The tank shall have sufficient capacity for the generating set to run the engine on full load for a period of 24 hours. A diesel containment tank shall be mounted below the fuel tank and must be large enough (110% of the diesel tank) to collect any fuel that might spill from the tank. The containment tank shall be manufactured from black mild steel with a thickness of not less than 2mm.

As an alternative to the free-standing type the fuel tank can be an integral part of the base frame of the generator set. The tank shall have sufficient capacity to run the engine on full load for a period of 24 hours. The base tank shall be an open channel self-bund walled type that shall be of sufficient capacity to contain a spillage equivalent to 110% in volume of the base tank. The containment tank shall be manufactured from black mild steel with a thickness of not less than 2mm.

A float level alarm connected to the generator controller shall be incorporated into the bund area located such that the alarm will be activated when 50% of the volume of the bund area has been reached in the event of any diesel fuel leakage.

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4. SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION

4.1. Engine

NO	ITEM	REMARKS
1.	Manufacturer's Name	
2.	Country of Origin	
3.	Manufacturer's model No. and year of manufacture	
4.	Continuous sea level rating after allowing for ancillary equipment : a) In b.h.p. b) In kW	
5.	Percentage de-rating for site conditions, in accordance with SANS 8528 a) For altitude b) For temperature c) For humidity d) Total de-rating	
6.	Net output on site in kW	
7.	Nominal speed in r.p.m.	
8.	Number of cylinders	
9.	Strokes per working cycle	
10.	Stroke in mm	
11.	Cylinder bore in mm	
12.	Swept volume in cm^3	
13.	Mean piston speed in m/min	
14.	Compression ratio	
15.	Cyclic irregularity	
16.	Fuel consumption of the complete generating set on site in l/h of alternator output at : a) Full load b) ¾ load c) ½ load NOTE : A tolerance of 5% shall be allowed above the stated value of fuel consumption.	
17.	Make of fuel injection system.	
18.	Capacity of fuel tank in litres	
19.	Is gauge glass fitted to tank?	
20.	Is electric pump for filling the fuel tank included?	

NO	ITEM	REMARKS
21.	Method of starting	
22.	Voltage of starting system	
23.	Method of cooling	
24.	Type of radiator if water-cooled	
25.	Type of heater for warming cylinder heads	
26.	Capacity of heater in kW	
27.	Method of protection against high temperature	
28.	Method of protection against low oil pressure	
29.	Type of governor	
30.	Speed variation in % a. Temporary b. Permanent	
31.	Minimum time required for as assumption of full load in seconds	
32.	Recommended interval in running hours for : a. Lubricating oil change b. Oil filter element change c. Decarbonising	
33.	Type of base	
34.	Can plant be placed on solid concrete floor?	
35.	Are all accessories and ducts included?	
36.	Is engine naturally aspirated?	
37.	Are performance curves attached?	
38.	Diameter of exhaust pipe	
39.	Noise level in plant room in dBA	N/A
40.	Noise level at tail of exhaust pipe in dBA	
41.	BMEP (4 stroke) at continuous rating (kPa)	
42.	% Load acceptance to SANS 8528, with 10% transient speed drop	

4.2. Alternator

NO	ITEM	REMARKS
1.	Maker's name and model no.	
2.	Country of Origin and year of manufacture	
3.	Type of enclosure	
4.	Nominal speed in r.p.m.	
5.	Number of bearings	
6.	Terminal voltage	
7.	Sea level rating kVA at 0,9 power factor	
8.	De-rating for site conditions	
9.	Input required in kW	
10.	Method of excitation	
11.	Efficiency at 0,9 power factor and : a) Full load b) ¾ load c) ½ load	
12.	Maximum permanent voltage variation in %	
13.	Transient voltage dip on full load	
14.	Voltage recovery on full load application in milli-seconds	
15.	Is alternator brushless?	
16.	Class of insulation of windings	
17.	Is alternator tropicalised?	
18.	Symmetrical short circuit current at terminals n Ampere	
19.	Type of Coupling	

4.3. Switchboard

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Is board floor mounted?	
4.	Finish of board	
5.	Make of volt, amp, and frequency meters	
6.	Dial size of meters in mm	
7.	Scale range of voltmeter	
8.	Scale range of ammeters	
9.	Ration of current transformers	
10.	Make of hour meter	
11.	Range of cyclometer counter	
12.	Smallest unit shown on counter (Item 11)	
13.	Make of circuit breaker	
14.	Type of circuit breaker	
15.	Rating of circuit breaker in Amp and fault level in kA	
16.	Setting range of overload trips	
17.	Setting range of instantaneous trips	
18.	Make of change-over equipment	
19.	Make of voltage relay	
20.	Is control and protection equipment mounted on a small removable panel?	
21.	Type of control equipment	
22.	Make of mains isolator	
23.	Type of indicators for protective devices	
24.	Make of rectifier	
25.	Type of rectifier	
26.	Is battery charging	
27.	Are volt- and ammeters provided for charging circuit?	
28.	Is the alarm hooter of the continuous duty type?	
29.	Rating in Amps of : a. Change-over equipment b. Mains on load isolator c. By-pass switch d. Circuit breaker to outgoing feed	
30.	Is manufacture of switchboard/control panel to be sub-let?	

NO	ITEM	REMARKS
31.	If yes, state name and address of specialist manufacturer	

4.4. Battery

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Type of battery	
4.	Voltage of battery	
5.	Number of cells	
6.	Capacity in cold crank amp	

4.5. Dimensions

NO	ITEM	REMARKS
1.	Overall dimensions of set in mm	
2.	Overall mass	
3.	Is the generator room adequate for the installation of the set	

4.6. Deviation from the Specification as an Alternative (State Briefly)

NO	DESCRIPTION

4.7. Spare Parts and Maintenance Facilities

NO	ITEM	REMARKS
1	Approximate value of spares carried in stock for this particular diesel engine and alternator	
2	Where are these spares held in stock	
3	What facilities exist for the servicing of the equipment offered	
4	Where are these facilities available	

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See attached BOQ 31

5. SECTION 5 – PRICE SCHEDULES

5.1. General

1) The conditions of contract and the application of the Contract Price Adjustment Provisions shall be as set out in the main contract.

2) The descriptions in this Price Schedule shall be read in conjunction with the specification.

3) The unit rate for each item in the Price Schedules shall include for all materials, labour, profit, transport, etc., everything necessary for the execution and complete installation of the work in accordance with the description.

4) The Price Schedules shall not be used for ordering purposes. The Contractor shall check the lengths of cables and overhead conductors on site before ordering any of the cables. Any allowance for off-cuts shall be made in the unit rates.

5) The rates shall exclude Value Added Tax and the total carried over to the final summary

6) All material covered by this Specification shall, wherever possible, be of South African manufacture.

5.2. Schedule

See attached electrical BOQ

TAFALOFEFE HOSPITAL: WASTE WATER TREATMENT AND CIVILS UPGRADE: MECHANICAL & ELECTRICAL INSTALLATION

SCMU5-24/25-0037(ME)

C3.4: SCOPE OF WORK

Portion 3

Particular Specification

MECHANICAL INSTALLATIONS

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MECHANICAL INSTALLATIONS

ME1: FIRE DETECTION AND EVACUATION ALARM

DETAILED SPECIFICATION FOR THE SUPPLY, INSTALLATION & COMMISSIONING OF FIRE ALARM, AND EMERGENCY EVACUATION SYSTEMS

1. GENERAL

This supplementary specification is for the supply, installation and commissioning of Fire Alarm and Fire Extinguishing systems.

The Conditions of Contract Form **JBCC March 2005, Edition 4.1** and the Department of Public Works Standard Conditions in respect of the Supply, Delivery and Installation of Electrical and Mechanical Equipment, Plant and Materials Form PW 379 and bid Form attached **SHALL APPLY TO THIS CONTRACT** as well as •the Department of Public Works Standard Specifications and SANS Standard Specifications listed below.

The works carried out under this subcontract shall be governed by the following specifications:

- Department of Public Works Standard Specifications:
  - PW 371 Specification of Materials and Methods to be used
  - STS 5 The Electrical Installations and Electrical Equipment pertaining to Mechanical Services : Issue IXa : December 1999
  - STS 9 Fire Security: Standard Technical Specification for an Inert Gas Agent Extinguishing System : FPO 4E (PW 335): January 1999
  - STS 10 Fire Security: Standard Technical Specification for an Automatic Fire Alarm Installation : FPO 5E (PW 336) : June 1994
  - STS 13 Fire Security: Standard Technical Specification for an Evacuation and Communication Systems : FPO 8E (PW 339) : October 2004
  - STS 17 Standard Technical Specification for the Preventive Maintenance, Servicing and Repair of Fire Security Installations (PW 341) : November 2000
- SANS Standard Specifications:
  - SANS 369 - Code of practice for the operation of fire protection measures
  - SANS 530 - Fire detection and fire alarm systems for buildings
  - SANS 728 - Automatic fire detection and alarm systems
  - SANS 7240 - Fire detection and alarm systems
  - SANS 8201 - Audible emergency evacuation signal
  - SANS 10139 - Fire detection and alarm systems for buildings - System design, installation and servicing
  - SANS 10142 - The wiring of premises
  - SANS 10400 - The Application of the National Building Regulations
  - SANS 50054 - Fire detection and fire alarm systems
  - SANS 52094 - Fixed firefighting systems - Components for gas extinguishing systems
  - ISO 8421 - Fire protection – Vocabulary
  - ISO 16003 - Components for fire-extinguishing systems using gas - Requirements and test methods - Container valve assemblies and their actuators # selector valves and their actuators # nozzles # flexible and rigid connectors # and check valves and non-return valves
  - ISO/IEC 29341- Information technology - UPnP Device Architecture
- Detailed Specification
- Tender Drawings

- Any relevant SANS Standard, local by-law, corporate specification and any national regulation promulgated by Act of Parliament such as the OHS Act 85 of 1993, whether specifically mentioned or referred to hereafter or not.

The Standard Specifications are not bound in this document. Standard Specifications may be obtained from the offices of the Consulting Mechanical Engineers on request provided they are not subject to copyright. Standards or Codes such as SANS, ISO, DIN, BS, EN may be obtained from the offices of SANS

Where reference is made in this specification and any drawings and documents mentioned therein to the Factories, Machinery and Building Works Act of 1941 this shall be deemed to be replaced by the Occupational Health and Safety Act, 1993.

Where reference is made in the Specifications and any drawings and documents mentioned therein to "Secretary for Public Works" or "Department of Public Works" or "Director General: Community Development" and "Department of Community Development", this shall be replaced by "Director General: Public Works" and "Department of Public Works" respectively

Tenders shall only be considered if the following requirements are strictly adhered to during the tender process:

- The main tender shall comply with the specification in all respects and no changes will be allowed in the Price Schedule or in the information schedules.

- The Schedules of the tender document must be completed fully and in detail for the tender. Any incomplete section will be regarded as not to specification and may lead to disqualification of the tender.

- Contractors may hand in alternative tenders together with the main tender. Alternative tenders will be considered if the main tender is acceptable. Alternatives shall be presented on separate pages but in the same format and details per the Specification. It shall be clearly shown what the differences are between the main offer and the alternative offers.

- When the total tender price of the installation is carried over to the price schedule form, it must include the first 12 months maintenance as specified.

- Bidders must ensure that the bid document is studied in full and that all the conditions are complied with during the bid process.

2. DRAWINGS AND APPROVAL (Refer to Standard Specification where applicable)

The bid drawings must be returned with the tender. Any proposed alterations to the layout shall be indicated on these drawings in red ink and may only be submitted as an alternative bid.

Not later than three weeks after signing the contract, or receiving verbal instruction, the successful bidder shall submit to the Engineer either four copies of his detailed working drawings, or written confirmation that the tender drawings will be used.

Approval by the Engineer of drawings submitted by the Contractor shall not relieve the Contractor of his liability to carry out the work in accordance with the requirements of the contract documents.

3. SCOPE OF WORK

The standard specification shall apply unless otherwise indicated in this section.

The drawings issued herewith and listed in the relevant section are to be read in conjunction with the specification and all items mentioned, together with all ancillary equipment necessary for the correct installation, operation and full compliance with the Standards and codes must be provided, notwithstanding the fact that they may not have been included in detail in these documents.

The work performed shall comprise the supply, delivery, offloading, interim storage, installation, testing, commissioning and leaving in good working order of the complete Fire Detection, Emergency Evacuation and Fire Extinguishing Installation inclusive of all guarantees as specified herein and the supply of 'AS IS' installation record drawings, Maintenance and Operating Manuals, Sign-Off Forms and documentation in accordance with the specifications and requirements for:

(i) Supply and installation of an Analogue Addressable Fire Detection System

(ii) Supply and installation of a Voice Alarm/Evacuation system

(iii) Supply and installation of a Fibre optic Fire Network

(iv) Programing of all sensors, line devices and alarm devices

(v) Testing and commissioning of the Analogue Addressable Fire Detection and Voice Alarm/ Evacuation Systems as required and specified

(vi) Liaising with all other Subcontractors on site

(vii) Provision of all O&M Manuals and As Built drawings as specified

The tenderer shall take cognisance and make due allowance for the fact that continuity and sequence of work is unlikely to occur and as such cannot and will not be guaranteed; claims arising from such instances will not be entertained.

Where or if tenderers have made specific or special allowances in this respect these shall be clearly indicated in a programme submitted with their tender offer.

Tenders must submit a programme showing what specific allowances have been made for working on each specialist installation.

Should a claim arise for extra time or overtime work due to out of sequence work or having to make programme changes to accommodate the Employer, the onus will be on the tenderer to prove that at the time of tender he could not have reasonably contemplated that such extra time or overtime would have been required nor that such instances would have occasioned.
It is the sole responsibility of the tenderer to ensure that all quotations obtained from manufactures and suppliers are complete in their entirety and must include all equipment and accessories necessary for compliance with current practice and the efficient and proper functioning of the installation.

If any such items of equipment, brackets and accessories, etc., have been omitted from a supplier's quotation, or incidental work is necessary, the tenderer must include for all such items and work in the tender.

All equipment offered by the tenderer shall be to the approval of the Engineer, prior to installation. This standard specification and the supplementary specification with drawings shall be carefully adhered. Equipment installed without the approval of the Engineer will have to be removed at the tenderer's expense and be replaced with officially approved listed items.

4. DESIGN CONDITIONS

Location: Tafalofefe, Kentani (45km from Butterworth)

Altitude: 50 m above mean sea level

External: Summer Max. Average : 30,0 DB : 25,0 WB
Winter Min. Average : 8,0 DB : 95% RH

Design conditions and performance specifications for individual plant components are in accordance with what listed hereafter.

The tenderer shall take due cognizance of the climatic conditions likely to be experienced, in both the summer and winter months, and allow for these in the selection of materials.

In addition, the electrical equipment shall be dust and weatherproof with the relevant applicable IP rating to suit the specific application

5. SYSTEM DESCRIPTION

5.1. General Information and Preferred Equipment

This tender is for the supply, installation and commissioning of a complete, Fire Alarm and Fire Extinguishing systems and all ancillary components as specified and shown in the drawings

Although the fire detection system design is not based on any specific make of equipment and components the equipment offered should be in preference manufactured in South Africa. Inferior equipment or equipment not matching the performance characteristics will not be considered and must not be offered.

5.2. Analogue Addressable Fire Detection Installation

The fire detection system is an addressable system that is connected to a voice alarm/evacuation system. The fire detection system is designed and programmed not only for early fire detection and warning but also to actuate the fire suppression/ extinguishing systems, initiate specific safety sequences in the equipment when required and monitor that such sequences can be initiated when required.

<u>Fire Control Panel</u>

The Analogue Addressable Fire Control panels shall be located as indicated on the drawings. The Fire Control Panels shall be a wall mounted semi recessed panels in a single, two or four loop/s configuration complete with a built in battery charger, all interfaces, and accessory boards needed to communicate/operate all devices/sensors described in this document.

The Fire Control Panels will be connected to a fire network but shall operate independent of all other panels. The Fire Control panels shall be connect to the site wide network via 2 core screened twisted pair cable (RS485) to a serial to fibre optic converters with Multimode, LC-connector to a Fibre optic network. (Fibre optic network will form part of this contract)

A 240V supply to the panel shall be provided. The Fire Control Panel's built in standby power supply system, shall be capable of supplying sufficient standby power for all the devices connected to the Fire Control Panel for a minimum duration of 48 hours in normal condition and then an additional 0,5 hours in Alarm Condition.

The Fire Control Panel and fire detection and alarm system shall be protected against any Electrical Spikes, Drops, EMF (Lighting strikes)

The front of the panel comprises a keypad, indicator LEDs, alpha numeric display unit, a "Day/Night" key switch and a 'More Time' push-button.

The following indication are provided by LEDs

- 40-Fire Zones
- 1- Supply Healthy
- 1- Supply Faulty
- 2- Common Alarm
- 1- Common Fault
- 1- Maintenance
- 1- Processor Running
- 1- Processor Fault

The alpha numeric display unit must display the Alarm Type, Zone Number, Sensor/ Device Number and provide a user-defined message for each Sensor/Device. The panel must have sufficient memory capacity to display a message of at least 40 characters for each Sensor/ Device connected to the system.

The Fire Control Panel shall also incorporate a "Commission" key switch and shall be fully field-programmable via a keypad, or via a PC with the suitable proprietary programming software installed

All panel wiring connections for both power and loop cabling must be provided with surge and spike arresting devices discharging all surges to earth. If more than one earth point is used all earths are to be equalised i.e. be at the same earth potential.

All wiring must be daisy chained; wiring spurs to devices will not be used.

<u>Remote Display Panel</u>

The Remote Display Panel shall incorporate the same type of display and mimic as the Fire Control Panel as well as all the LED displays. The panel shall have a keypad to access certain functions of the Fire Panel (commissioning can only be carried out from the Fire Control Panel); the remote panel will not incorporate an event printer unless otherwise specified.

The remote display panel located as indicated on the drawings shall be wall mounted surface panels, with a 24V supply from the Fire Control Panel or an external 24Vdc Maintained Electrical Power Supply

System Operation

The system operates in two modes, Night/Building Empty and Day/Building Occupied, the modes selectable via the key switch on the Fire Control Panel only.

Day/Building Occupied Mode

Sensors in public areas operate at normal or low sensitivity.

All fire signals received by a sensor are to be confirmed by a second sensor in the same zone or any break glass unit; (to activate the Gas Extinguishing system the sensor and break glass must be in the same protected zone) all confirmed signals will be automatically relayed to the Fire Control Panels and the Voice Alarm/Evacuation system, if not cancelled (reset) within a specified time (less than four minutes). All signals which are not responded to will be considered a confirmed signal.

The person attending to the alarm can call for more time by pressing the “More Time” push button, on Fire Control panel or Remote Display panel ,in which instance the clock will be reset to zero and a new cycle (programmable between O and 999 seconds) will be initiate. During such cycle the attendant/s must be capable of investigating the source of the alarm and cancel it at the panel (by pushing the reset button) in the event of a false alarm or confirm it by breaking the glass of any break glass unit.

The alarm may only be cancelling from the Fire Control panel, Remote or Display panels.

It must be noted that operation of the “More Time” push button shall be overridden by the triggering of a second sensor/device in the same zone or via any break glass unit.

Night/Building Empty Mode

Sensors in public areas operate at normal or high sensitivity.
All fire signals received by a sensor are automatically relayed to the Fire Control Panel and the Voice Alarm/Evacuation system, activating the local evacuation loudspeakers /sounders/sirens and visual alarms.

Voice Alarm/Evacuation system.

The Voice Alarm/Evacuation system is a sound system for emergency purposes, to alerts occupants of a hazard that can require their safe and orderly evacuation from the building, and operate as part of a fire detection and alarm system. It is can be operates automatically or manually.
Confirmed fire signals will be automatically relayed as an alarm messages to the Voice Alarm/Evacuation system by Fire Control Panel, if not cancelled (reset) within a specified time (less than four minutes) all signals which are not responded to will be considered a confirmed signal.

The transmission link between the Voice Alarm/Evacuation system and Fire detection system is supervised by the Fire control panel the input/output interfaces provide confirmation that the signals transmitted are received and fault- condition warning that will be will be displayed as a text message at the Fire Control Panel and printed on the event printer.

All alarm messages relayed to the Voice Alarm/Evacuation system shall be alert level broadcasts, evacuation level broadcasts shall be made only from remote fireman’s microphones, as well as from the amplifier’s built-in fireman’s microphone.

Voice-alarm condition can be silenced and/or reset from the fire detection system

The Fire Control Panel shall activate the evacuation sounders/siren if;

- The Alert level broadcast is not cancelled (reset) or an Evacuation level broadcast is not made within a specified time (less than four minutes).
- No Confirmation from the Alarm/Evacuation system that alarm messages signal transmitted was received
- Alarm message signal transmitted and a fault- condition.
- Voice-alarm condition can be silenced and/or reset from the fire detection system.

Operation of Fire Detection System in the Event of a Fire

In the event of a confirmed fire condition, the fire Detection system is too automatically:

- Relayed an alarm messages to the Voice Alarm/Evacuation system and operate the visual alarms (rotating beacons/strobes)
- Shut down any ventilation fans (if applicable)
- Shut down any air handling units (if applicable)
- Activate the closing of all fire/smoke door
- De-activate the access controlled magnetic locks on fire escape doors
- Sound the evacuation sounders/siren (if the Voice Alarm/Evacuation system fails to operate correctly or in Night/Building Empty mode).

These functions will be grouped differently depending on where the signal originates from. The yellow manual call point (break glass unit) inside a gas protected area will operate as double knock devices (i.e. when activated they will not require a confirmation signal); all other manual call points (break glass units) will only activate the evacuation alarms.

Printer

A 24 column printer is built in to the Fire Control Panel and shall provide a hard copy of all Alarms, Faults, Maintenance Data, Panel Operations and Outputs operated. Operation of the printer shall not inhibit, delay or affect the functioning of the detection system in any way.

The printer shall indicate the following information for each alarm or signal:

- Type of Alarm or Fault
- Device Type
- Device Number
- Zone Number
- User message (40 characters)
- Day
- Date
- Time

It shall be possible to set the printer to print either alarms, faults, panel operations or outputs operated, or all of these, or any combination thereof.

Sensors (Multi-criteria sensor Addressable Fire Detector)

All sensors shall comply with the standard specification; the type and location of sensors shall be as indicated on the drawings.

All sensors must be clearly labelled with the sensor number on both the base and sensor head to prevent incorrect location of sensors.

Manual Call Points (Addressable Break Glass Units)

All manual call units shall comply with the standard specification; the location of which shall be as indicated on the drawings. The units shall be supplied with hinged clear cover and re-settable element.

The manual call units shall be supplied in two colours

- Red - activate the evacuation alarms, alert the system of a fire, or confirming a fire before a second sensor is triggered (Standard Manual Call Point)
- Yellow - Manual override to the Gas Discharge unit in the same protected zones (located only inside a gas protected room)

All manual call units must be clearly labelled for ease of location of manual call units.

Line Devices

All line devices shall comply with the standard specification. The type and location of line devices are shown on the drawings.

Line Relays: (Addressable Control Unit)

The Contractor will provide the line relay and connect to a 24V contactor coil. The contactor and wiring to its contacts to be carried out under this contract.

Interface Units: (Addressable Monitor Units)

The interface units used shall be with Normally Open contacts either of the 'sprinkler' or 'non-fire' types; an end of line resistors shall be provided with each interface unit.

The Contractor will be expected to provide the interface units and connect to voltage free contacts which are to be monitored as follows:

- Contact open Normal
- Contact closed Alarm
- Wiring open Fault
- Wiring shorted Fault

Addressable Line Isolators

Line isolators are to be used to protect against short circuits and are to be positioned no further than 20 detectors apart, or on entering a new zone (i.e. no more than 20 detectors or one zone will be isolated in the event of a short circuit).

Addressable Sounders

All sounders shall comply with the standard specification; Base sounder and horn type sounders shall be located in positions as indicated on the drawings. The Sounders shall operate in zones or in the event of a general alarm all together. The supply shall be monitored for open circuits, short circuits and any supply faults, and any anomalies/faults shall be reported to the Fire Control Panel as a fault.

All sounders should be an addressable line device requiring no extra wiring either than the 2 wire looped cable used for wiring detectors, they may however be wired on a separate loop.

Addressable Visual Alarms

All visual alarms shall comply with the standard specification; they shall be located in positions as indicated on the drawings. The visual alarms shall operate in zones or in the event of a general alarm all together, consisting of a clear lens and red LED element with a flash energy at a minimum of 1.0 Joule between 0.5-1Hz(1 flash every 2 seconds – 1 flash every second)

The visual alarm be an addressable line device requiring no extra wiring either than the 2 wire looped cable used for wiring detectors, they may however be wired on a separate loop. The visual alarm

Two way monitored output unit (Sounder Driver)

The Sounder Driver is an addressable unit monitoring and activating two output circuits for driving conventional sounders via an external 24Vdc power supply. The sounder driver shall be located at the maintained power supply to monitor the loss of mains, and battery supply or the 24Vdc output to the two circuits (rated 1amp 24Vdc)

Evacuation Siren & Beacon 120db

All evacuation sirens & beacon shall comply with the standard specification; they shall be located as indicated on the drawings. The evacuation siren shall be rated at 120db 24V DC.

The sirens shall be operated by the dedicated sounder relays on the Fire Control Panel or by an addressable monitored output unit. The supply shall be monitored for open circuits, short circuits and any supply faults, and any anomalies/faults shall be reported to the Fire Control Panel as a fault.

The alarm beacon shall be non-addressable type red lens Xenon beacon, flash energy at a minimum of 5 Joule / 24 Volt DC supply.

Zones

It must be possible to randomly allocate, by software, any device or sensor, from any line, to any zone. The zoning of devices shall be finalised by the consulting engineer only prior to the programming of the Fire Control Panels.

Fire Brigade/Alarm Signalling

No direct connection to the Fire Brigade will be required.

It shall be possible to connect and SMS modem to the fire Control panel.

Labelling / Addressing of all devices

Each device shall have its own address that will include both loop number and panel number, to be clearly indicated on each device and device base.

This address shall be obtained from the Consulting Engineer prior to installation / programme of the devices.

Fire Alarm Electrical Work

Wiring

The fire alarm installation shall be wired as a 2 wire looped system, so that it will be possible to access a zone from either end. The system will be wired in 1, 2 or 4 loops, to suite the panel, with a maximum of 127 detectors/devices per loop.

All systems controlled/ switched by the fire alarm installation that are not wired in a fail-safe configuration (open circuit in alarm condition) shall have a fire rating of no less than 1/2 hour.

The fire alarm wiring must comply with the manufacturer's specification.
The contractor will be responsible for all wiring required by the fire alarm system to operate any of its integral components. All PVC wiring shall be 1000 V grade. All wiring shall comply with SANS 10142 and the standard specification.

Conduits and Wire-ways
Galvanised trunking wire-ways and/or wiring baskets are to be to run above the ceilings on the surface of roof/floor slabs and walls. Conduit is to be chased into brick and run in inaccessible roof or floor voids.

No PVC saddles or fixing/ mounting clamps may be used

All detector bases shall be fixed to thin wall galvanised round conduit box. Where bases are used on movable or fixed ceiling tiles the box will be connected with a length of flexible conduit to a conduit box fixed to the slab soffit.

All conduits and conduit accessories shall bear the SANS mark.

Maintained Electrical Power Supply

Each Fire Control Panel will include a power supply and a built in battery charger. However some components that form part of this contract will require independent power supplies. These power supplies shall consist of a 220Vac/24Vdc converter with a 5amp dc output rating. The power supply shall be capable of supplying sufficient standby power for all the connected components for a minimum duration of 24 hours in normal condition and then an additional 0, 5 hours in Alarm condition.

The power supply, battery charger and battery/s, shall all be housed in proprietary named wall mounted lockable metal housing

5.3. Voice Alarm/Evacuation system.

General

The voice alarm/Evacuation system shall be the an integrated public address and emergency evacuation system, provide for emergency broadcasts, business broadcasts and background music (BGM) audio, up to 60 speaker zones, 4 remote call stations, system supervision, spare amplifier switching, loudspeaker line surveillance, digital message management, system emergency power supply/manager with back-up batteries and be capable of connecting to EN54-24 compliant loudspeakers and accessories to provide an integrated sound system for emergency purposes shall be fully SANS 7240 compliant

The system shall be permit broadcasts to:

- Individual zones
- Any combination of zones
- All zones together ("All call")

Emergency broadcasts shall be made in 2 alarm levels (Alert and Evacuation) and shall be alarm messages (audible alarms or pre-recorded voice announcements) or voice communication where required, any emergency broadcast shall disable or override all non-emergency purposes (e.g. paging, music or general pre-recorded announcements),

Emergency broadcasts shall be permitted from the multi-functional amplifier's built-in fireman's microphone, as well as from remote fireman's microphones, and can be remotely controlled by the Fire Control Panel.

Controller

A multifunctional amplifier, mountable in an EIA-standard 19" equipment rack or on a desk-top, shall function as the Voice Alarm system Controller. The controller shall be a stand-alone system with up to 6 speaker zones (100 V line), or expanded to up to 60 speaker zones using additional 6-zone extension amplifier/routers. Up to 4 call stations shall be connectable.

Standby Amplifier

A Power amplifier shall be of compatibly size to the master amplifier shall be used as standby amplifier for the voice alarm/Evacuation system, managed by Controller /master amplifier. The Power Amplifier shall have overheating protection, short-circuit/open-circuit protection, and variable output voltage speaker line (50/ 70V/ 100V).

Emergency power supply

Emergency power supply manager for the power management and distribution of power supply units and batteries, as well as emergency power for other PA systems Automatic switchover from AC-mains to battery DC-operation in case of an AC-mains power failure. The Emergency power supply shall be capable of supplying sufficient standby power for all the connected components for a minimum duration of 24 hours in normal condition and then an additional 0,5 hours in Alarm condition.

EVAC Loudspeakers

All EVAC Loudspeakers shall comply with the standard specification; they shall be located in positions as indicated on the drawings. The speakers shall be rated at 6 watts RMS with 100 volt supply. A 100 volt matching transformer, with four primary taps shall be mounted on the back of the speaker. The speaker shall be fitted with an integrated metal grid grille finished in off-white colour.

The following loudspeaker shall be used:

A) Ceiling mounted speaker

The loudspeaker shall be a 5" (12cm) cone-type speaker suitable for ceiling mounting
Rated Noise Power: 6 Watt(100V)
SPL (1W, 1m): 90 dB
Dimensions (Ø x H): 180 x 121 mm

B) Wall mounted speaker

The loudspeaker shall be a 6" (16cm) double cone-type speaker enclosed in a metal cabinet, suitable surface- or semi-flush- mounted to the wall.
Rated Noise Power: 6 Watt(100V)
SPL (1W, 1m): 94 dB
Dimensions (W x H x D): 310 x 190 x 90 mm (30mm semi –flush)

All EVAC Ceiling Loudspeakers shall be securely mounted inside a metal fire domes by mounting springs. The fire dome shall be clamped to the ceiling prior to the installation of the speaker. The fire dome shall have a ceramic bridging connector to allow the speaker cabling to connect directly to it.

The dome shall be secured by a safety chain to an anchoring point of a non-combustible material.

The Contractor will be expected to provide adequate mounting supports for the ceiling mounted EVAC Loudspeakers and fire dome, so as to prevent the ceiling from sagging under their weight.

Installation

All system components and accessories shall be installed by personnel trained by the manufacturer; proof of this shall be submitted with the tender offer.

All systems shall be installed according to the guidelines as stated in the manufacturer's installation, operation, inspection and maintenance manual.

All systems shall be signed off by the manufacturer as complying with his requirements; proof shall be submitted prior to First Delivery.

Technical Data

Applicable Standards: The system shall comply with SANS 7240-16/19.

6. RECORD KEEPING AND LABELLING

6.1. Labels

All equipment shall have a unique number inscribed on a label and fixed to the equipment. These numbers shall correspond with that on the drawings and in the manuals.

6.2. Design Information

The following information shall be indicated on a label:

- The battery type and size. (next to the batteries)
- The quiescent load and alarm load in amps of the system. (next to the batteries)
- The sizes of all the fuses. (next to the fuses)
- The dates that the batteries were installed. (on the batteries)
- The number of each detector, break glass unit, interface, relay or other activation or initiating devices. (on or next to the unit)

6.3. Record Keeping

A record shall be kept of each inspection and test in a book next to the fire panel.
The record book shall state at least the following:

- List of all fire detection panels, alarms, sensors and devices.
- The date and name of the person and company carrying out the services / tests / inspections.
- Comments on the tests or inspections.
- The voltages measured for the battery tests.

The date on which batteries were installed shall be clearly marked on the batteries and also indicated in the record book.

6.4. Blocked / Reference Plans

All framed drawings fixed to the wall next to the fire panel shall be kept up to date with changed information on the fire detection system. The drawing shall contain at least the following:

- The building name as shown outside the building otherwise as known by the users of the building.
- The panel number shall also be shown.
- All the initiating devices and their numbers and types shall be shown.
- A symbol list of all the symbols used on the drawing.
- The positions and numbers of all the battery chargers and gas cylinders shall be shown.
- Detection and gas zones must be indicated.
- The drawing shall be at least A3 size but large enough to contain all the required information.
- The drawing shall be mounted behind glass with a hard wood frame.

7. ELECTRICAL WORK

Three phase 400 volt 4 wire plus earth supplies or 230 volt 2 wire plus earth supplies shall be provided and will terminate in the control panel. The Subcontractor will be required to allow for the fixing of a white on black engraved traffolite label identifying the supply origin, and whether the panel or part of it is on emergency/standby power, as well as a white on red engraved traffolite label with the words “FIRE ALARM” in the Distribution board identifying each circuit supplying the fire alarm installation

Final connections from the isolators or panels to the various systems or units inclusive of all switch gear, inter-connecting cable, wiring channels, instrumentation and controls etc. will form part of the Contract. The Contractor shall make an allowance for the isolators to be located in position visible from the unit or system or panel to be isolated and on average at a distance of not exceeding three metres.

8. DAMAGE CAUSED BY VOLTAGE SURGES

All damage caused by lightning or power surges must be fixed under this contract. No such claims will be considered.

The Contractor must note that the Butterworth area is prone to lightning and voltage surges must therefore be expected.

The contractor is advised to install surge protection equipment on the systems and to regularly check the surge protection equipment for proper operation. The Contractor is advised to contact a specialised lightning protection specialist to assist with the design of the surge protection.

9. TEST EQUIPMENT

The contractor shall ensure that the following equipment is available on site for the engineer's use.

- A digital multimeter.
- Smoke and heat detector testers suitable to reach heights of 6 meter.
- Testers to test batteries.
- Test equipment to test flame detectors, etc, if applicable.

10. BUILDER'S WORK

All builder's work will be detailed and such information will be supplied to the Engineer for approval prior to it being implemented.

In general, where pipe work must be built in, as work progresses on site the Contractor will be required to ensure timeous installation of such items.

Dimensions and positions will be the responsibility of the tenderer.

11. ALTERNATIVE OFFER

The tenderer must quote strictly in accordance with the Engineer's specification and drawings, and alternative offers requested in the documentation but should the tenderer wish to propose further alternative offers to the specification, then the tenderer must provide complete technical details on the alternative equipment proposed and list amounts ("ADD" or "OMIT"), in the Schedule of Alternative Offers.

Unless all the relevant information is provided, full assessment of the alternative offer cannot be made and such offers shall not be considered

No changes to the design or equipment specified will be considered after adjudication and appointment of the Contractor for this Contract.

The following is a reference list of equipment which generally speaking is of acceptable design and construction:

<u>Smoke and Heat Detector System</u>

Locally designed and manufactured equipment shall be supplied in preference. The tenderer shall be at liberty to offer any make of equipment provided that the equipment matches the design and performance specifications stated in this document.

12. TESTS AND COMMISSIONING

If required, the methods and standards used in ISO R859 or any other acceptable means of testing approved by the Engineer shall be used to determine the following rated capacities of the system as specified:

12.1. Analogue Addressable Fire Alarm Installation

Each component (detector head, line relay, interface unit, interlock, door closer etc.) comprising the installation will be tested for operation as an individual component (e.g. smoke test, continuity test etc.) and under simulated fire conditions. The Contractor shall allow for simulating fire conditions at least once per fire zone. The software will also be tested in a similar manner.

The Contractor shall allow for conducting a range of tests under simulated fire conditions with the Employers representatives and satisfy himself and the Consulting Engineer that they are sufficiently conversant with the system operation to distinguish false alarms from true alarms and act accordingly. Training of the Employer's representatives will form part of the system commissioning.

The Contractor must note that he is expected to have tested the entire installation in accordance with what stipulated above and to have rectified all defects and malfunctions prior to him calling the engineer to site to witness the First Delivery test.

All defects which affect the operational safety of the system will prevent acceptance of First Delivery of the system until they are rectified and the defective installation retested in its entirety. Every failed test must be repeated in its entirety. All costs for abortive trips to site and Engineer's time where these are incurred because of the Contractor's negligence will be paid for by the Contractor.

The following inspections and tests will be carried out at the time of handover. Minor omissions or defects will be noted and are to be rectified within 7 days. Major omissions will result in the cancellation of the handover, and a new date set for the handover. All testing equipment is to be provided by the contractor at no additional cost.

Documentation

All documentation, i.e. Operation instructions, maintenance instructions, manuals installation drawings, wiring and circuit drawings, programme printout etc., as called for by the tender documents, are to be presented.

Documents are to be complete in all respects and properly bound or mounted, as required.

Equipment

All installed equipment will be inspected for compliance with the following:

Equipment is to be fully in accordance with the specification attached to the tender documents.

Equipment is to be new and free from scratches and marks.

All labels and instructions are to be bilingual (English and second language to be advised) and permanently marked or affixed. Labelling of the "Dymo-Tape" type will not be accepted.

All installed equipment will be examined for workmanlike assembly and finish. Particular attention will be paid to secure mounting of components, neat and secure installation of wiring, and proper labelling of all components and terminals.

All installed equipment must have a detailed non fading circuit drawing (preferably schematic) showing all components (with values, part and terminal numbers) permanently affixed inside the equipment, or framed and mounted on the wall adjacent to the equipment.

Installation

Installation will be expected for secureness, neatness, and workmanlike finish.

Equipment is to be mounted in a secure manner, in the correct position, with the base parallel to the floor.

All conduits, MICC, cabling etc, must be securely and neatly fastened as described in the tender documents. Ends and terminations must be properly executed.

Wiring and terminations will be inspected for neatness, proper saddling and stripping, and correct colour coding and numerical labelling in accordance with the drawings.

Particular attention will be paid to neatness of wiring inside panels and junction boxes. Wiring runs must be either parallel or at 90˚C to each other. Wiring must not be run across the front of any components or equipment in such a manner as to prevent easy observation, testing, servicing or replacing of any item of equipment. Untidy wiring inside panels or boxes will not be accepted.

Operational Tests

The following operation tests will be carried out on the system to ensure compliance with the tender documents.

Detectors:

All detectors will be tested by means of applying smoke and/or heat to the detector (all functions must be tested on multi sensor heads).

Break Glass Units:

All break glass units will be tested.

Zones:

All zones will be checked to ensure that when a detector or break glass unit is activated the correct zone lamp lights up and the correct message is displayed.

One detector chosen at random in each zone is to be disconnected, and the panel checked to ensure that a “fault” signal has been received and the correct message is displayed.

All alarms, bells, beepers, sirens, hooters, or other audible alarms are to be tested.

If the audible alarm circuits are monitored, then one audible alarm unit chosen at random, in each zone, is to be disconnected, and the panel checked to ensure that a “fault” has been received and the correct message is displayed.

The Fire Control Panel: (is to be tested as follows)

Correct lamps light-up when alarm or fault is initiated from zone.

Audible alarm silences when “silence” button is pressed.

Audible alarms must re-start after being silenced when an alarm is initiated from another zone.

An alarm is to be initiated from a break glass unit. The break glass unit is then to be returned to its normal position. The panel is to be checked to see that it is still displaying an alarm, i.e. that it is “latched” into the alarm condition.

The panel is to reset when the “re-set” button is pressed.

The LED’s entire are to light-up when the “lamp-test” button is pressed.

The correct message is displayed, including zone and device identification.

Battery Operation:

The following tests will be done to ensure proper operation on the standby power supply batteries (if provided):

The mains supply to the panel is to be disconnected:

- The system must change over to the standby batteries.
- The panel must give a “fault” signal and indicate a “Mains Failure” condition.
- One detector or break glass unit in each zone must be activated and all alarms, lamps, etc., must work normally, and at full level.

The system must be left, in a standby, normal condition, operating on its batteries for the full duration of the standby battery period as specified in the tender documents.

At the end of this period the following tests will be done:

a) Battery voltage is to be re-measured and recorded.
b) The battery voltage must be above the minimum required by the control panel, as specified by the manufacturer.
c) One detector in each zone is to be tested.
d) The panel is to be checked for correct functioning.
e) The audible alarms are to be checked for adequate volume.

Detector Voltage:

The voltage at the last detector in each zone is to be measured, with a voltmeter, and recorded, under the following conditions:

- With the mains on.
- With the mains off, immediately after switching off.

Under all these conditions, the voltage at the detector must be within the voltage range required by the detector, as specified by the manufacturer of the detector.

Simulation Test

Smoke Detectors

A fire consisting of two crumpled sheets of full-size newspaper is to be made in a suitable container of wire mesh or similar. This fire is to be made at floor level at the most furthers distance away from a detector, in the room or area being tested.

The detector must initiate the alarm within 2 minutes of the newspaper being lit.

Heat Detectors

All heat detectors shall be performance tested with a hair drier.

Audible Alarms

The system is to be activated into alarm, with the audible alarms operating. These must be heard with adequate volume in all areas where this is required as specified.

Interface Units and Line Relays

All interface units and line relays must be checked individually and collectively as correctly operational with mains power and with battery power. All display LED's must indicate corrects operation of all such units individually and collectively.

12.2. Voice Alarm/Evacuation system

If required, the methods and standards used in ISO R859 or any other acceptable means of testing approved by the Engineer shall be used to determine the following rated capacities of the system as specified:

The Contractor must note that he is expected to have tested the entire installation in accordance with what stipulated above and to have rectified all defects and malfunctions prior to him calling the engineer to site to witness the First Delivery test.

All defects which affect the operational safety of the system will prevent acceptance of First Delivery of the system until they are rectified and the defective installation retested in its entirety. Every failed test must be repeated in its entirety. All costs for abortive trips to site and Engineer's time where these are incurred because of the Contractor's negligence will be paid for by the Contractor.

The following inspections and tests will be carried out at the time of handover. Minor omissions or defects will be noted and are to be rectified within 7 days. Major omissions will result in the cancellation of the handover, and a new date set for the handover. All testing equipment is to be provided by the contractor at no additional cost.

Documentation

All documentation, i.e. Operation instructions, maintenance instructions, manuals installation drawings, wiring and circuit drawings, programme printout etc., as called for by the tender documents, are to be presented.

Documents are to be complete in all respects and properly bound or mounted, as required.

Equipment

All installed equipment will be inspected for compliance with the following:

Equipment is to be fully in accordance with the specification attached to the tender documents.

Equipment is to be new and free from scratches and marks.

All labels and instructions are to be bilingual (English and second language to be advised) and permanently marked or affixed. Labelling of the "Dymo-Tape" type will not be accepted.

All installed equipment will be examined for workman like assembly and finish. Particular attention will be paid to secure mounting of components, neat and secure installation of wiring, and proper labelling of all components and terminals.

All installed equipment must have a detailed non fading circuit drawing (preferably schematic) showing all components (with values, part and terminal numbers) permanently affixed inside the equipment, or framed and mounted on the wall adjacent to the equipment.

Installation

Installation will be expected for secureness, neatness, and workmanlike finish.

Equipment is to be mounted in a secure manner, in the correct position, with the base parallel to the floor.

All conduits, MICC, cabling etc., must be securely and neatly fastened as described in the tender documents. Ends and terminations must be properly executed.

Wiring and terminations will be inspected for neatness, proper saddling and stripping, and correct colour coding and numerical labelling in accordance with the drawings.

Particular attention will be paid to neatness of wiring inside panels and junction boxes. Wiring runs must be either parallel or at 90˚C to each other. Wiring must not be run across the front of any components or equipment in such a manner as to prevent easy observation, testing, servicing, or replacing of any item of equipment. Untidy wiring inside panels or boxes will not be accepted.

13. MAINTENANCE AND SERVICE CONTRACT

The tenderer shall include in the tender price for carrying out at least two inspections of the installation during the first year from the date of practical completion.

The tenderer shall compile a full report within two weeks of having completed each inspection and forward the same to the Consulting Engineer for record.

14. DOCUMENTATION, DRAWINGS AND AS BUILT DRAWINGS

The tenderer shall in addition to documentation specified in the Standard Specification furnish the Engineer with three sets of documents and drawings related to the approved concept, design, installation, commissioning, operation and maintenance of the entire system and its components, on or before the Practical Completion date.

All documentation is to be submitted in both hard copy and digital format.

The following drawings are required:

- Layout drawings (plans, sections, elevations, isometric diagrams, 3D drawings etc.) identifying each component (hard copies and electronic copies)
- The Contractor shall note that acceptable drawing formats are AutoCAD

The following documents are required:

- Full description of the system/s
- Operating instructions
- Installation instructions
- Commissioning instructions
- systems programme printouts
- Maintenance instructions, maintenance schedule and troubleshooting guide

The tenderer will include all supplier's information that is available in electronic format in both hard copies and in electronic format neatly catalogued for easy reference.

The tenderer shall include in the tender price the cost year for servicing and maintaining the installation on behalf of the client for one year after one year from the date of Practical Completion.

A full and detailed description, listing the extent of the service/ maintenance work to be carried out at each service, is to be shown separately and included with this document.

The number of services included per year to be clearly stated and will consist of at least (but not limited to) four quarterly inspections of the complete installation at intervals not exceeding three (3) months after practical completion.

The tenderer shall compile a full report within two weeks of having completed each inspection and forward the same to the Consulting Engineer and Employer for record.

15. GUARANTEE OF THE INSTALLATION

The equipment will be subject to twelve (12) months guarantee against breakdown or failure due to inferior design, material or workmanship shall be replaced free of charge, including cost of labour and travelling, on such an occurrence by the tenderer.

The guarantee period will commence from the date of Practical Completion of the project. The successful tenderer will be responsible for all the repairs and/or replacement of equipment during the guarantee period.

The guarantee shall not apply to replacements or repairs made necessary by misuse of negligence on the part of persons other than those in the employ of the successful tenderer

16. OPERATING & MAINTENANCE MANUALS

Operating Manuals

The tenderer shall supply as part of the contract three (3) copies of the Operation Manual and "As Built" drawings for Fire Alarm and Fire Extinguishing Systems
At least one month before commissioning, one draft copy shall be submitted to the Engineer (and if required the Client) for comment and approval.

Although the manuals contain information of a technical nature wherever possible and practicable manuals must be compiled in layman's language.

Operating manuals shall give a clear description of and the purpose of the installation.

a) Paper copies of all approved drawings and diagrams.
b) Detailed description of the different components used in the installation.
c) On- and off switching procedures.
d) Guidelines for routine-test to be carried out by the User Department inclusive of the periods during which tests are to be undertaken.
e) Detailed instructions for procedures to be followed during a fault

The tenderer shall in addition to documentation specified above and/or in the Standard Specifications furnish the Engineer with two sets of documents and drawings related to the concept, design, installation, commissioning, operation and maintenance of the entire system and its components, on or before the date for Practical Completion.

The following drawings are required:

- Layout drawings
- Schematic circuit drawings
- Schematic pipe work drawings
- Internal circuit drawings of all panels, etc.
- **Wiring drawings showing wire colour codes and numbers as well as all connections onto terminal strips (markers to be approved by the Engineer)**.

The following documents are required:

- Full description of the system.
- **Operating instructions**.
- Installation instructions.
- Commissioning instructions.
- Maintenance instructions, maintenance schedule and troubleshooting guide.
- Programme printout

Maintenance Manuals

Three complete sets of maintenance manuals (Technical) prepared in English shall be supplied by the Contractor.

At least one month before commissioning a draft copy shall be submitted to the Engineer for comments and approval.

Maintenance manuals shall consist of the following:

a) A general description of the system.
b) A general description of the controls.
c) Schedule of equipment, model numbers, optional extras, modifications, electrical power requirements, etc.
d) Detailed monthly, quarterly, semi-annually and annual preventative maintenance procedures.
e) Manufacturer's catalogues clearly indicating type, size and model of equipment supplied.
f) Tabulated commissioning data of all equipment and systems, indicating- as measured and according to specification - requirements.
g) List of suppliers, addresses and telephone numbers.
h) List of spare parts for all equipment.
i) Fault tracing/finding procedures.

Manuals shall be bound in a firm hard cover.

The information shall be clear and readable and supplied with an index.

The above mentioned manuals shall be available at Practical Completion; Practical Completion of the installation will not be accepted without the manuals.

17. TRAINING OF STAFF

The Contractor shall allow for instructing Department of Justice appointed responsible persons in the correct maintenance of the installation. The Subcontractor shall use only competent staff to carry out training and where a company has been specified to carry out commissioning the same company must be used by the Contractor to carry out Operation and Maintenance Training. In broad terms training must cover the same subject contents in the Operating and Maintenance Manuals in sufficient detail for the staff to be able to perform all the required adjustments and operations without third party assistance

SCHEDULES OF EQUIPMENT OFFERED

The tenderer shall supply a complete schedule of all equipment in the Main or any alternative offer in the format indicated below.

Fire Detection System

Item of Equipment	Rating/ Capacity	Manufacturer	Model No	Remarks
Fire Control Panel				
Multi Sensor Detector				
Line Relay				
Interface Unit				
Line Isolator				
Manual Call Point				
Sounder				
Sounder Beacon				
Sounder Driver				
Evacuation Siren & Beacon				
Fire Brigade/Alarm Signalling				
Wiring (fire signal)				
Wiring (24 V)				
Conduit				
Galvanised wiring baskets				
Standby Power Pack				
Battery Charger				
Batteries				

Voice Alarm/Evacuation system

Item of Equipment	Rating/ Capacity	Manufacturer	Model No	Remarks
Controller				
Extension Amplifier				
Standby Power amplifier				
Power amplifier input module				
Emergency power supply				
Mounting Rack				
Desk Top system microphone				
Remote fireman's microphone				
EVAC ceiling mounted loudspeaker				

TENDER DRAWING LIST

Drawing No.	Drawing Title
1807-FD01	TAFALOFEFE HOSPITAL: FIRE DETECTION SITE PLAN
1807-FD02	TAFALOFEFE HOSPITAL: FIRE DETECTION CASUALTY, X-RAY GENERAL & MATERNITY WARDS FLOOR PLAN
1807-FD03	TAFALOFEFE HOSPITAL: FIRE DETECTION STAFF HOUSING, DINING KITCHEN, STORES, LAUNDRY & CLINIC/PHC FLOOR PLAN
1807-FD04	TAFALOFEFE HOSPITAL: FIRE DETECTION ISOLATION & TB WARDS FLOOR PLAN
1807-FD05	TAFALOFEFE HOSPITAL: EVACUATION SYSTEM CASUALTY, X-RAY GENERAL & MATERNITY WARDS FLOOR PLAN
1807-FD06	TAFALOFEFE HOSPITAL: EVACUATION SYSTEM STAFF HOUSING, DINING KITCHEN, STORES, LAUNDRY & CLINIC/PHC FLOOR PLAN
1807-FD07	TAFALOFEFE HOSPITAL: EVACUATION SYSTEM ISOLATION & TB WARDS FLOOR PLAN

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POLLUTION CONTROL TECHNOLOGIES
Water Conservation, Wastewater and Environmental Management Specialists

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3.7 SPECIFICATIONS FOR ENVIRONMENTAL MANAGEMENT OF CIVIL ENGINEERING CONTRACTS: TAFALOFEFE HOSPITAL: REFURBISHMENT OF WATER SUPPLY

Property of Pollution Control Technologies
PO Box 15686
Beacon Bay
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Revision date 20140825

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The execution of the Environmental management plan for the project may require site or incident specific instructions from a qualified environmental consultant.

Pollution Control Technologies cannot be held liable for non-compliance with any terms or conditions of this specification or any permit or authorisation issued to the Client, Engineering Consultant or Contractor.

This specification does not remove the responsibility of the Client to obtain the necessary approvals envisaged in terms of Regulations in terms of Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998).

The environmental consultant may call for specific method statements for any portion of the work and these may be over and above the requirements of this specification.

The cost schedule for projects may provide payment items for complying with these specifications.

Item	Main Heading	Specification
1	**GENERAL**	The Contractor's attention is drawn to requirements of the Environmental Specification which are intended to compliment the requirements laid down in SABS 1200 and are not intended to extend these requirements except where the Contractor fails to take due care and then the additional requirements shall be at the expense of the Contractor. The following is a list of the legislation which can, inter alia, have an effect on construction activities or the environment. This list is not necessarily complete and the onus shall remain on the Contractor to ensure that all relevant legislation is complied with. National Environmental Management Act (No.107 of 1998) (GN R.543 dated 16 June 2010 and the Listings Notices) are particularly relevant. Forest Act, No 122 of 1984. Provincial Nature Conservation Ordinances. Minerals and Petroleum Resources Development Act, No 28 of 2002. National Water Act, 1998. Health Act, No 63 of 1977 Conservation of Agricultural Resources Act, No 43 of 1983. Particularly Sections 6, 7, 25 and GN R1048. Atmospheric Pollution Prevention Act, No 45 of 1965. Occupational Health & Safety Act, No.85 of 1993.
2	**SITE CAMPS**	Where site camps are to be established the topsoil is to be removed to a depth of 150 mm and stockpiled according to the section on topsoil conservation. The site shall be located more than 100 metres from any watercourses or wetlands. Runoff from the site must be prevented from entering any watercourse or wetland in the vicinity of the site camp or work area. Site camps and surrounds are to be maintained in a clean orderly and presentable condition at all times and the limits of the site camp are to be clearly defined at all corners with marker posts of at least 100 mm diameter and not less than 2 metres high (above ground level). The Contractor shall restrict all activities associated within the site camp to within this boundary. Damage to the environment outside of these boundaries will result in a penalty. There will be adequate barriers in place to prevent members of the public, and unauthorised persons, from entering the site. Site camps are not to incorporate dwellings that are occupied. At the end of the contract, or the removal of facilities from the site, the Contractor shall be responsible for the rehabilitation of the demarcated site. Failure to demarcate any site will result in the Project Environmental Control Officer (PECO) defining the area to be rehabilitated at the cost of the contractor. Waste water from kitchen and ablution facilities shall be led to the on site sewers and shall not be discharged to rivers or streams. Adequate toilet facilities are to be provided at the site camp. Toilets are to be in place, and functional, from the first day of establishment. Failure to have functional toilets on site will result in a daily penalty per unit. After completion of the works the Contractor shall restore the area used by him to its former condition, including removal of rubble and foundations. Any compacted ground shall be ripped to loosen soil. Topsoil is to be spread evenly over the site and grass cover re-established.
3	**WATER**	The contractor shall ensure that adequate supplies of potable water are available at the site camp and at all areas. Adequate disinfection measures are to be in place to ensure that the water is safe to drink. The engineer may request analysis of the water to confirm potability. Where connections to an existing water supply (piped) is in place the contractor may request permission to connect to this source by making a formal application to the Hospital. In this case the water is to be metered and weekly use recorded in the environmental site file. In every case the contractor is to manage water use and ensure that wastage is minimized.

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		Water for construction from any water course or dam requires a General Authorization from Department of Water Affairs and the onus is on the contractor to secure the rights to use this water.
4	**SANITATION**	Adequate toilet facilities are to be provided within 200 m of all work sites and at the site camp. All toilets shall be maintained by the Contractor in a clean sanitary condition to the satisfaction of the Engineer. Toilets shall not be located on flood plains or within 100 metres of a water course, or at any location where the possibility of flooding exists. All toilets on site are to be adequately secured against wind. Contractors are required to provide separate toilets for male and female workers on site. The disposal of toilet wastes shall be done to an approved facility and proof of safe disposal certificates are to be presented at each monthly site meeting. Contractors shall instruct their staff and sub-contractors that they must use toilets provided and not the veld, bush or streams. A penalty system is to be put in place by the contractor to discourage illegal use of the veld.
5	**REFUSE**	The site camp and working areas are to be kept clean, neat and tidy to the Engineers satisfaction. The Contractor shall provide bins at the work sites and shall be responsible for disposal of refuse and waste generated by his staff on a daily basis. Domestic litter or construction waste may not be left lying about on site. The contractor is required to maintain a waste facility at the site camp where waste is stored prior to off-site disposal. Waste types (wood, paper, steel and domestic waste) are to be sorted according to type and efforts are to be made to re-cycle waste where practical. Refuse and construction waste shall be disposed of at an approved waste disposal sites. No burning or burial of refuse is permitted.
6	**FUEL STORAGE**	Tanks for fuels, oils and solvents storage shall be bunded with earth berms adequate to contain any possible spills (at least 110 % of the stored volume). It shall be the Contractors responsibility to remove any contaminated earth and dispose of the material to a suitable and approved disposal site and to provide proof of safe disposal. On site storage of fuel may not exceed 80 cubic metres without an Authority from DEDEAT. Each and every fuel storage site shall have a complete spill kit and the kit shall be controlled by trained staff.
7	**NOISE**	Noise levels are to be kept within reasonable norms as determined by the Engineer, taking into account the context of the site location. Silencers on all machinery and vehicles shall be well maintained. The Contractor shall inform residents of any excessive noise that is anticipated due to construction activities, for example blasting for excavation. This notice shall be given at least 3 days before the event generating higher noise levels.
8	**DUST**	Dust is regarded as a nuisance when it reduces visibility, soils private property or is aesthetically displeasing. Dust generated by construction related activities must therefore be minimised. The Contractor shall control dust over the site of the Works, on access roads/tracks, on stockpiles and spoil sites or borrow pits. Control of dust may involve spraying with water. The quantities of water used should not be large enough, or applied with sufficient force, to generate run-off which could result in soil erosion. The contractor shall have the necessary equipment available on site to control dust.
9	**DISEASE CONTROL**	All staff working on the waste water treatment site are to be notified of the risks of handling sewage and infrastructure associated with sewage. The Contractor shall prepare a suitable template for such a briefing for approval prior to use. All staff on site are to be provided with suitable de-worming treatment at 3 monthly intervals or on termination of their work duties on site. A register of treatment given is to be available in the site environmental file.
10	**BLASTING**	Blasting has a number of impacts such as dust, fly rock, rolling rock and vibration. The Contractor must take appropriate measures to minimise the generation of dust from blasting operations. No blasting will be permitted unless the Contractor has satisfied the Engineer that his proposed blasting methods and controls are such that no damage will be caused to any adjoining structure, pipeline, services, trees or sensitive vegetation.

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Authorized use for project : Tafalofefe Hospital
Consulting Engineer : CSE Consulting
Control Number : E276-CSE-DOH-1-2014

		Topsoil may not be used as cover material for blasting.
11	**SOCIAL DISRUPTION**	The Contractor's staff shall in no way be a nuisance to residents in the vicinity of construction activities. Any work in public places shall be adequately barricaded and steps shall be taken to minimise the disruptive effects of construction. Any complaints received by the Engineer and recorded in the site environmental control file . The action taken must be recorded. It is not expected that graves or artifacts occur on the site but any graves sites are to be respected and all set outs are to be off-set by at least 20 metres from any graves. In the event of a grave being disturbed, or artifacts being uncovered, work is to stop immediately and the area must be secured. On no account is the site to be closed or efforts made to remove or relocate the remains or the artifacts. The Engineer and the Environmental consultant are to be notified immediately and a course of action prescribed. The maintenance and protection of the site shall be the responsibility of the contractor until either the South Africa Police Services or the National Heritage Resources Council issue a directive.
12	**OVERHEAD POWER LINES**	Where work is being carried out in the vicinity of overhead power lines, the Contractor is responsible for ensuring that all persons working in such areas are aware of the relatively large distance that high voltage electricity can short to earth when large masses of steel such as steel pipes or machinery are close to power lines.
13	**EXISTING SERVICES AND INFRASTRUCTURE**	The Contractor shall ensure that existing services, (road, pipelines, powerlines and telephone services) are not damaged or disrupted unless required by the Contract and then they shall only take place with the permission of the Engineer. The Contractor will be responsible for the repair and reinstatement of any existing infrastructure that is damaged or services which are interrupted. Such repair or reinstatement will be to the Contractor's cost, and shall receive top priority over all other activities. A time limit may be stipulated by the Project Manager in consultation with the Engineer. Any trenching that restricts access to the works site are to be adequately barricaded during work and restored within 24 hours of opening. Temporary access is to be provided to occupied premises at all times. Where cross-overs are in place, these are to have adequate safety barricades so as to not cause harm.
14	**CONCRETE BATCHING**	Concrete batching plants shall be located more than 100 m from the nearest river channel. The batching site shall be bunded with earth berms or sandbags such that runoff cannot escape from the site. Contaminated stormwater and wastewater runoff shall not be permitted to enter streams but shall be led to a pit where the water can soak away. Waste concrete and cement sludge shall be scraped off the site of the batching plant and removed to an approved landfill site. This measure is intended to prevent pollution in the event of rainfall. Adequate measures shall be taken to control dust from stockpiles and the batching plant processes. The placement of the batching plant shall not be closer than 500 metres from the nearest dwelling or occupied premises.
15	**SERVICING OF EQUIPMENT**	The contractor will be required to conduct all servicing of machines and equipment within a designated area within the site camp. The contractor shall ensure that there are adequate facilities for the handling and storage of used parts, oils, grease, cleaning fluids and fuels. Drip trays are to be available for use at the servicing area. In the event of a breakdown on site, the contractor may temporarily repair equipment on location provided that drip trays are in place during all work and a spill control kit is within 30 metres of the works area. All sites shall have at least one spill control kit on site at all times and the contractor shall have suitably trained staff available when work is taking place on site. If servicing takes place at remote sites, the service crew shall have at least one drip tray, a spill kit and vessels for storage of used oil and spares.
16	**CONTROL OF STORAGE AREAS**	All areas used for the storage of materials shall be clearly demarcated and should not allow unauthorised access especially if there is any danger to the residents. The storage of sand, stone, bricks and large pipes is not to take place on areas without removing and protecting topsoil. Rehabilitation of the site after use is the contractors responsibility. Care must be taken that pipe stacksdo not pose a danger to the general public. Stack heights are not to exceed 3 metres. Large pipe sections are to be placed in such a manner that they are not able to roll and there must be adequate fire breaks in place to ensure that the storage site is safe and secure.
17	**LIMITS TO THE WORKS AREA**	The limits of the work area are to be clearly defined at all direction changes with marker posts of at least 100 mm diameter and not less than 2 metres high (above ground level). The placement of the boundary markers is to be such that at least two (2) poles are visible to any person at ground level. On long linear alignments it may be necessary to place poles between direction changes to cover dead ground. The Contractor shall restrict all activities associated within the work area

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		to within this boundary. Damage to the environment outside of these boundaries will result in a penalty.
18	**NO-GO AREAS**	Work area is to be limited to within the external the boundary of the Hospital, the route for the rising main, pump station area at the dam and the fence line around the dam.
19	**DEALING WITH TRAFFIC**	The contractor shall ensure that adequate warning signage is placed at intersections with established roads in accordance with traffic safety requirements.
20	**FIRE PREVENTION AND CONTROL**	The Contractor and his staff are expected to be very conscious of fire risks. The Contractor shall hold fire prevention talks with staff to create an awareness of the risks of fire. Regular reminders to staff on this issue are required. The Contractor shall at all times ensure that fires do not start or spread within the site or the environs thereof as a result of the works or the actions of employees. In the event of such fire the Contractor shall immediately employ such plant and labour as is at his disposal and shall take all other necessary action to bring any such fire under control, all at his own cost. A fire extinguisher must be on hand whenever re-fuelling, welding or any other spark generating activity is conducted. The area around the existing digesters and an exclusion zone of 50 metres from the structures is to be designated flame-free as the methane can be explosive.
21	**SLUDGE MANAGEMENT**	The removal and relocation of any sludges from the site will require detailed method statements to ensure that handling, transport and disposal do not result in pollution of the local environment. The contractor is required to understand the risks of high water content, plastic, sludges and ensure that these risks are communicated to all on site and that the required precautions are in place at all times.
22	**IMPACTS OF WORK ACTIVITIES ON THE OPERATION OF THE EXISTING WASTE WATER TREATMENT WORKS**	The existing wastewater treatment works receives up to 150 cubic metres of sewage per day for treatment. The contractor has to ensure that the disruption of the treatment processes in the works are interupted as little as possible. The contractor will be expected to set up a cooperative relationship with the works operator and provide adequate warning of possible disruptions, and provide support, where required, to minimize the impacts caused by the contract.
23	**REINSTATEMENT OF WORK AREAS**	The topsoil shall be replaced on top after backfilling and only lightly compacted (eg. by trampling under foot). Use of the original vegetation sods is the preferred method of final rehabilitation and these sods are to be placed in the soil, roots down, and not placed to be above the original ground level. Where grass seeding is required it must be carried out on the same day as topsoil replacement and before lightly compacting the soil. Care shall be taken to ensure that the finished surface is not below the surrounding ground to avoid channelling, concentrating flows or pooling. Suitable ground cover will be required around process structures.
24	**PROTECTION OF PUBLIC**	The Contractor shall be responsible for protecting the public from anything dangerous to persons or property and for the safe and easy passage of pedestrians and vehicular traffic in those areas affected by the Works. This clause shall apply from the time that any portion of the Works shall be commenced until the completion of all outstanding works, which the Contractor has undertaken to finish during the period of maintenance. Any excavation, material dumps, spoil dumps or other obstructions likely to cause injury to any persons or animal shall be suitably barricaded.
25	**TOPSOIL CONSERVATION**	Topsoil shall be excavated from the following areas affected by construction: - site camps and material storage locations, - all areas to be excavated pipelines and services and process units, and, areas used for batching of concrete. Topsoil shall be excavated to the base of the A-horizon or 150 mm whichever is greater, and stockpiled. The topsoil shall not be mixed or contaminated with any other material. Where topsoil is to be reused for end of contract rehabilitation, stockpiles are not to exceed 2 metres in height and the material is not to be driven over. The natural vegetation and seeds are to be allowed to grow but alien vegetation is to be removed. Where surplus topsoil occurs approval must be requested to establish stockpiles higher than 2 metres. Erosion of stockpiles will not be permitted. At sites where soil will be stockpiled for several months, these stockpiles shall be hand seeded with a suitable rehabilitation mix at the rate of not less than 8 kg/ha. Compaction of the topsoil by,

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		inter alia, driving over it is not permitted. Subsoil shall be stockpiled separately.
26	**MATERIALS SUPPLY FOR CONSTRUCTION**	The contractor is to note that in terms of this specification all materials required for the execution of this contract will be sourced from commercial sources. For the purposes of controlling materials used on site and preventing supply from unlicenced sites, contractors are required to declare their sources of material supply and provide proof that these suppliers are registered with DMR.
27	**CONSTRUCTION WASTE (BUILDING RUBBLE)**	The disposal of building rubble from the site shall be strictly controlled. No indiscriminate tipping will be allowed and the contractor is required to source suitable locations for the disposal of construction waste. These disposal sites are to be declared to the engineer prior to commencement. Prior to commencement the PECO is to be provided with a letter from the site owner confirming acceptance of the rubble. This letter is to then be placed in the site environmental file.
28	**REHABILITATION THE WORKS AREA**	The Contractor is responsible for the whole of the works site. The demarcations required for the site camp should also be used at all defined sites within the works area (reservoirs and structures). On linear work areas the work area will be considered to extend 10 metres from the outer boundaries of the actual work area. By way of example, the work area for a 600 mm trench will be 10m+0.6m+10m, or a road will be 10m+6m+10m. These corridors can be reduced by a motivation from the Contractor to the Engineer and ECO. Work outside of these areas will attract penalties. Temporary access tracks made by the Contractor over grassland or open veld must be ripped to a depth of 150 mm to loosen soil to encourage grass growth. Seeding may then be required in some cases. The re-establishment of vegetation will be monitored for six months after completion of backfilling to assess whether the vegetation cover is adequate to prevent erosion. Extra measures including composting, sodding, sprigging, hand seeding or hydro-seeding may be required in order to achieve adequate rehabilitation. Rehabilitation of temporary access tracks, and any disturbed areas outside of the allowed working areas, to their original condition will be at the Contractor's expense. Blast rock and boulders which are removed from the works and which are visually detracting or environmentally unacceptable shall be removed to an approved spoil site. Complete rehabilitation of all work areas will be required to return the site to its former condition. This will include removal of all cement sludge, waste concrete, builders, refuse etc, ripping of compacted surfaces to loosen soil, replacement of topsoil and re-grassing.
29	**EROSION CONTROL**	No erosion will be permitted on site. Areas affected by construction related activities must be monitored on an ongoing basis for evidence of rill/sheet erosion. Remedial measures shall be applied at an early stage before a severe erosion problem arises. Erosion prevention measures must be implemented under the instruction of the Engineer but it is in the contractors interests to be proactive. Areas particularly susceptible to erosion are areas where topsoil has been stripped, soil stockpiles, spoil sites and borrow pits, and steep slopes traversed by the pipeline. On any areas where the risk of erosion is evident, special measures may be necessary to prevent erosion. These may include planting of grass sods , hydro-seeding, or sprigging with approved seeds or plant stock or the placement of deflection berms.
30	**REMOVAL OF TREES**	Indigenous trees may not be removed nor damaged. It should be noted that no wood or forest products may be transported from site without a valid permit. Generally the presence of protected trees would have been established prior to work starting on site. It is in the interests of the contractor to check that the site is clear, and to ask for confirmation if any specific trees or plants are noted. Soil shall not be piled around the trunks of the trees as this can result in attack by termites, which can ringbark and kill the trees.
31	**ALIEN VEGETATION**	Disturbance to the natural vegetation will encourage the establishment of exotic/alien plant invasive species. The species are likely to include Black Wattle (*Acacia memsii*), Lantana (*Lantana camara*), Bugweed (*Solanum mauritianum*), Mauritius Thorn (*Caesalpinia decapetala*), and American Bramble (*Rubus cuneifolius*), and Kikuyu grass (*Pennisetum* spp) and selected non-woody weeds. These alien species must be eradicated when they begin to establish themselves about the works. Eradication must take place before the plants reach maturity. Permission may be granted, on request from the Contractor, for controlled burning of dried stockpiles of weeds to reduce the possibility of re-seeding taking place. In order to discourage the spread of invasive plants, soil shall not be moved from one part of the site to another without the approval of the Engineer.

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		The Environmental Control Officer will assist in the identification of alien plant species which must be controlled and removed and he will advise on methods of eradication. Methods will normally involve hoeing by hand or selective use of herbicides (only in exceptional circumstances and then with prior approval). The contractor is encouraged to be proactive with control systems as these plants are able to spread rapidly if re-vegetation is not achieve quickly.
32	**REQUIREMENT TO APPOINT A SITE ENVIRONMENTAL CONTROL OFFICER**	The contractor is required to appoint an Environmental Control Officer (ECO) who will be the Contractors on-site representative who will be responsible for the application of the Environmental Management requirements of this specification. The site ECO will be appointed in writing and shall be available at the initiation of the contract. After award the first activities shall be to develop the environmental file (which is not the same as the Safety File) and develop the general method statements to achieve compliance. These method statements are to be submitted to the engineer and PECO for approval prior to site establishment. The contractors ECO shall be available on site at all times and shall be responsible for maintaining an environmental site file. The site ECO shall monitor site on a daily basis and ensure that training is given to staff to ensure compliance with the EMP specifications. These actions will form part of the daily report. The ECO shall audit site compliance on a fortnightly basis and present a report at each monthly site meeting. The report is to be incorporated into the minutes of the monthly meeting. The Client will appoint a PECO to control the overall aspects of the site environmental requirements and to audit the contractors performance and apply the necessary penalties for non-compliance. The Clients PECO is an independent party and is responsible for advising DEDEAT in the event of gross non-compliance.
33	**REQUIREMENT FOR METHOD STATEMENTS**	Work in environmentally sensitive areas will require method statements that reflect the manner in which the Contractor intends to protect the environment while conducting construction work within the area. These method statements are required 14 days prior to any work commencing within a sensitive site, and then the work may only start once the method statements are approved by the Engineer and the ECO. The method statements required for this project (prior to commencement) of any site activity will be provided to the contractor at the notification of the contract award.
34	**SITE FILE FOR ENVIRONMENTAL COMPLIANCE**	Each project site is required to open and maintain a site environmental file that contains at least the following information: ● The Environmental Management Plan (EMP) specifications ● The Method Statements for the project ● Appointment of the Environmental Control Officer (ECO) for the project ● Correspondence relating to EMP issues ● Internal audit reports ● Engineers audit reports ● External audit reports ● Record and details of training of staff ● Record of attendance of Contractors ECO on site ● Record of areas covered in ECO audits. ● Record of community notification ● Copies of material source permits or method statements and approvals for agreed local sourcing of materials ● Register of toilets on site and servicing ● Worker de-worming treatment records ● Statement of intent from Contractors. Directors to apply and comply with the EMP requirements. ● Copy of the Record of Decision for the project (if required).
35	**REQUIREMENTS FOR MONITORING**	The Engineer will monitor the Contractor's performance in relation to the Environmental Specifications on at least a monthly basis. After each inspection, a report will be prepared for the Client and incorporated into the monthly site meeting minutes. The content of these reports will be made known to the Contractor by the Engineer. Any infringement of the Environmental Specification will be indicated in the report. These reports will also aim to anticipate problems which may arise so that the Contractor can be alerted to any potential environmental risks and take appropriate action. From time to time throughout the contract the Clients Environmental Control Officer (ECO) (who may be referred to as the Project Environmental Control Officer (PECO)) will conduct audits of the site and compile an audit report which will be submitted to the Engineer, Contractor and the relevant DEDEAT office. The PECO will be an independent Environmental Practitioner approved by DEDEAT .
36	**PAYMENT FOR**	The client shall make payment to the contractor on submission of a payment

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Authorized use for project : Tafalofefe Hospital
Consulting Engineer : CSE Consulting
Control Number : E276-CSE-DOH-1-2014

	IMPLEMENTATION OF THE EMP	certificate from the Consultant. The Consultant shall adjudicate claims on the basis of performance and compliance with the requirements of the EMP and fulfilment by the contractor of the requirements of the EMP specification against the scheduled items. These scheduled items shall inter alia include: 1. Provision for management of the general requirements of the EMP as a lump sum payable pro rata against progress (time based). This amount shall be considered to include all contractual obligations of the EMP not priced separately in the Bill. 2. Costs of administration of the meetings required for the EMP, including minute keeping, distribution, venue and management. The amount payable shall be reflected as a monthly cost and shall include all the administration costs of managing the EMP. 3. Requirement for additional method statements for selected activities shall be paid per method statement provided the method statement adequately fulfils the requirement of the activity. The amount payable will be deemed to include all costs of producing the method statement, including any revisions and the costs of applying the requirements of the method statement. 4. Training requirements of the EMP shall be considered to be part of the costs of complying with the EMP specification. 5. Provision for penalties to be applied shall be assigned in the Bill and any penalties deducted against this item. It should be noted that failure to implement routinely the requirements of items 2, 3 and 4 (above) shall result in the non-payment of the pro rata amount and the application of a penalty equivalent to 75% of the amount claimed per item.
37	**WORK STOPPAGE**	The Engineer shall have the right to order work to be stopped in the event of significant infringements of the Environmental Specifications until the situation is rectified in compliance with the specifications. In the event of this happening the Contractor shall not be entitled to claim for delays. It should be noted that projects that have a Record of Decision issued by DEDEAT can be stopped at any time by an instruction from DEDEAT.
38	**ENVIRONMENTAL AUDITING AND PENALTIES**	Each project shall be audited by a suitably qualified and experienced environmental auditor (usually the PECO). In terms of this specification an audit sheet which records all the audit items of the specification will be provided to the contractor at the site handover meeting. In line with items listed above, the PECO and Engineer will use the same audit sheets for fortnightly and monthly audits. These audits will record the degree of compliance (1 = Nil compliance; 7 = Full compliance) and shall be maintained in a Site Environmental Compliance file. It should be noted that audits by the contractor and engineering staff are for internal evaluation. The PECO audit will be the measure of compliance with the specification and is not bound by the internal audit assessment. In terms of compliance with this specification all contractors are required to achieve an overall compliance level of more than 75%. While the compliance level is below 75%, and the contractor scores '3' or less for more than 5 line items a penalty will be deducted from the contractors payments. The penalty will be based on the **Level 1** contravention amount and the actual amount will be determined using the formula (**Level 1** penalty x ((actual compliance/expected compliance) x 100)). After 75% compliance is exceeded, any audit point that scores less than "3" will attract a penalty of equivalent to a **Level 1** penalty. The responsibility for recording penalties for environmental non-compliance may only originate from the PECO. It is however the responsibility of the Engineer to call the PECO to site should it be found that serious non-compliance with the EMP specification is taking place. In such a case there are likely to be penalties imposed, or a stoppage of work, and the cost of this additional audit will be funded out of the penalties deducted. Penalties shall be deducted from monies due to the Contractor each month.
39	**PENALTIES FOR NON-COMPLIANCE AND CONTRAVENTIONS**	Penalties incurred for non-compliance will not relieve the Contractor from any claims for damages under common law. For example, claims arising from damage to persons or property due to fire, or injury to persons or livestock due to unmarked hazards, will remain the Contractors responsibilities. In the event of specific infringements of the Environmental Specifications the schedule of quantities lists specific penalties that will apply and the quantum of the penalty.These specific penalty amounts can be applied in addition to the non-compliance recorded on the audit assessment sheet. These penalties are

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		discretionary amounts and can be changed (or waived) dependent on the circumstances. The principle of fairness shall apply and the penalty may not be applied in addition to another penalty for the same non-compliance, and the quantum shall be in line with the potential impact of the contravention. Significant violation of the EMP specifications will be adjudicated using an Impact Level rating system. The rating system is defined as follows: Level 1 incident Environmental incidents not covered in Level 2 and Level 3 and generally more severe than the identified non-compliance items in the bill of quantities. Level 2 incident Incidents which resulted in any of the following: A moderate impact on the physical or biological environment (air, land, water or habitats) with limited impairment of ecosystem function or surface/ground water resource. An inconvenience/disturbance/disruption/annoyance (including odour, dust, noise, traffic problem, loss of water supply) of moderate duration and with medium impact. A minor impact on fauna or flora in a statutory designated area or a declared no-go area. Level 3 Incident Incidents which resulted in any of the following: A significant impact on the physical or biological environment (air, land, water or habitats) with extensive or long-term impairment of ecosystem function or surface/ground water resource. An inconvenience/disturbance/disruption/annoyance (including odour, dust, noise, traffic problem, loss of water supply) of long duration and/or with a long-term effect on the environment and/or community. An impact on protected species or habitats. The penalties that apply to the above incident rating system shall be determined as follows: Penalty - Level 1 incident : R -10000 Penalty - Level 2 incident : R -35000 Penalty - Level 3 Incident : R -100000 The imposition of the penalties does not replace Contractors liabilities stipulated in relevant legislation for contravention or failure to comply. The client shall not be responsible for any penalties imposed on the Contractor in terms of any statutory requirements. Also refer to the attached Schedule of ad-hoc penalties that will be applicable for specified infringements.
40	**DISPUTE RESOLUTION**	In the event of any dispute arising out of this EMP, its interpretation, applicability or claimed rights or obligations arising from it, then and in the event it is agreed that such dispute will be dealt with in terms of the dispute resolution clause provided for in Clause 10 of the General Conditions of Contract for Works of Civil Engineering Construction, applicable to the contract at hand. Should one or other party elect to exercise its rights arising from this EMP then and in that event, that party shall do so in accordance with Clause 10 of the General Conditions of Contract for Works of Civil Engineering Construction, applicable to the contract at hand.

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C3.8 EPWMP SPECIFICATION

EPWP SPECIFICATION

AWARDED TENDERER WILL BE REQUIRED TO ADHERE TO ALL EPWP SPECIFICATIONS AND REQUIREMENTS.

FOR FULL SPECIFICATIONS AND REQUIREMENTS VISIT www.epwp.gov.za

safe working practice
OCCUPATIONAL HEALTH AND SAFETY GROUP

Project Health and Safety Specification

In terms of Construction Regulations 2014

Project Client

Eastern Cape Department of Health

Description of Project Works

Contract SCMU5-24/25-0037- Tafalofefe Hospital: Water and Wastewater Treatment Works

Project Location

Tafalofefe Hospital, Centani

Preparation Date

14 March 2024

Project Health and Safety Specification developed by:

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South African Institute of Safety and Health (SAIOSH) - South Africa
Association of Construction Health and Safety Management- South Africa

PROJECT HEALTH AND SAFETY SPECIFICATION
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1.0 SPECIFIC PROJECT INFORMATION

1. 1 INTRODUCTION AND DEFINITIONS

THE REQUIREMENTS OF THE CONSTRUCTION REGULATIONS 2014 (AND GUIDANCE NOTES OF 2017) HAVE BEEN IN EFFECT SINCE 7TH AUGUST 2014. THE REGULATIONS PLACE LEGAL DUTIES UPON PRINCIPAL CONTRACTORS AND CONTRACTORS. ALTHOUGH THIS HEALTH AND SAFETY SPECIFICATION INCLUDES MUCH OF THE CONTENT OF THE REGULATIONS, THE CONTRACTOR WILL BE DEEMED TO BE FAMILIAR WITH THE REQUIREMENTS OF THESE REGULATIONS, AND OTHER ASSOCIATED HEALTH AND SAFETY REGULATIONS, AND TO HAVE FACTORED IN ALL THE DUTIES PLACED UPON CONTRACTORS AND PRINCIPAL CONTRACTORS IN THE TENDER. A COPY OF THE REGULATIONS CAN BE VIEWED ON THE DEPARTMENT OF LABOUR'S WEBSITE.

PLEASE NOTE THAT THE TERMS "CONTRACTOR" AND "PRINCIPAL CONTRACTOR" HAVE THE SAME MEANING AS THAT IN THE CONSTRUCTION REGULATIONS AND ARE USED INTERCHANGEABLY IN THIS DOCUMENT, I.E., REFERENCES TO "CONTRACTOR" REFER TO PRINCIPAL CONTRACTOR AND/OR CONTRACTOR AS THE REGULATIONS PERTAIN TO THEIR FUNCTIONS.

This Health and Safety Specification contains clauses that are generally applicable to construction activities, as well as imposing pro-active controls associated with activities that impact on Health and Safety as it relates to work on site. Compliance to the requirements of the Occupational Health and Safety Act 1993 is an additional requirement of this Health and Safety Specification and is part of the Contractor's responsibility. The Client, and/or their agents, will monitor that all Contractors comply with the requirements of such legislation.

ALL REFERENCES TO CLIENT IN THIS HEALTH AND SAFETY SPECIFICATION ALSO REFER TO SAFETY AGENT, WHERE SO APPOINTED.

Definitions (as per the Construction Regulations 2014) applicable to this Health and Safety Specification:

"agent" means a competent person who acts as a representative for a Client;

"angle of repose" means the steepest angle of a surface at which a mass of loose or fragmented material will remain stationary in a pile on the surface, rather than sliding or crumbling away;

"bulk mixing plant" means machinery, appliances or other similar devices that are assembled in such a manner so as to be able to mix materials in bulk for the purposes of using the mixed product for construction work;

"client" means any person for whom construction work is being performed;

"competent person" means a person who has, in respect of the work or task to be performed, the required knowledge, training and experience and, where applicable, qualifications, specific to that work or task: Provided that where appropriate qualifications and training are registered in terms of the provisions of the National Qualification Framework Act, 2000 (Act No.67 of 2000), those qualifications and that training must be regarded as the required qualifications and training; and is familiar with the Act and with the applicable regulations made under the Act;

"construction manager" means a competent person responsible for the management of the physical construction processes and the coordination, administration, and management of resources on a construction site;

"construction site" means a workplace where construction work is being performed;

"construction supervisor" means a competent person responsible for supervising construction activities on a construction site;

"construction vehicle" means a vehicle used as a means of conveyance for transporting persons or material, or persons and material, on and off the construction site for the purposes of performing construction work;
"construction work" means any work in connection with -

- the construction, erection, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure; or
- the construction, erection, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system; or the moving of earth, clearing of land, the making of excavation, piling, or any similar civil engineering structure or type of work;

"construction work permit" means a document issued in terms of regulation 3;

"contractor" means an employer who performs construction work;

Note:
a) Includes organisations and or self-employed person that contracts with a client, principal contractor, or a contractor to carry out construction work.

"demolition work" means a method to dismantle, wreck, break, pull down or knock down of a structure or part thereof by way of manual labour, machinery, or the use of explosives;

"design" in relation to any structure, includes drawings, calculations, design details and specifications;

"designer" means a competent person who-

- prepares a design;
- checks and approves a design;
- arranges for a person at work under his or her control to prepare a design, including an employee of that person where he or she is the employer; or
- designs temporary work, including its components;
- an architect or engineer contributing to, or having overall responsibility for a design;
- a building services engineer designing details for fixed plant;
- a surveyor specifying articles or drawing up specifications;
- a contractor carrying out design work as part of a design and building project; or
- an interior designer, shop-fitter, or landscape architect;

"ergonomics" means the scientific discipline concerned with the fundamental understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design in order to optimise human well-being and overall system performance;

"excavation work" means the making of any man-made cavity, trench, pit or depression formed by cutting, digging or scooping;

"explosive actuated fastening device" means a tool that is activated by an explosive charge and that is used for driving bolts, nails, and similar objects for the purpose of providing fixing;
"fall arrest equipment" means equipment used to arrest a person in a fall, including personal equipment, a body harness, lanyards, deceleration devices, lifelines, or similar equipment;

"falsework" means a combined system of formwork and support work;

"formwork" means temporary or permanent shutters used to form wet concrete into elements of a structure, and includes both horizontally and vertically placed shutters;

"fall prevention equipment" means equipment used to prevent persons from falling from a fall risk position, including personal equipment, a body harness, lanyards, lifelines or physical equipment such as guard-rails, screens, barricades, anchorages or similar equipment;
"fall protection plan" means a documented plan, which includes and provides for -

- all risks relating to working from a fall risk position, considering the nature of work undertaken;
- the procedures and methods to be applied in order to eliminate the risk of falling; and
- a rescue plan and procedures;

"fall risk" means any potential exposure to falling either from, off or into;
"health and safety file" means a file, or other record containing the information in writing required by these Regulations;

"health and safety plan" means a site, activity or project specific documented plan in accordance with the Client's health and safety specification;

"health and safety specification" means a site, activity or project specific document prepared by the Client pertaining to all health and safety requirements related to construction work;
"material hoist" means a hoist used to lower or raise material and equipment, excluding passengers;

"medical certificate of fitness" means a certificate contemplated in regulation 7(8);

"mobile plant" means any machinery, appliance or other similar device that is able to move independently, and is used for the purpose of performing construction work on a construction site;

"National Building Regulations" means the National Building Regulations made under the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977), and promulgated by Government Notice No. R. 2378 of 30 July 1990, as amended by Government Notices No's R. 432 of 8 March 1991, R. 919 of 30 July 1999 and R. 547 of 30 May 2008;

"person day" means one normal working shift of carrying out construction work by a person on a construction site;

"principal contractor" means an employer appointed by the Client to perform construction work;

"Professional Engineer or Professional Certificated Engineer" means a person holding registration as either a Professional Engineer or Professional Certificated Engineer in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000);

"Professional Technologist" means a person holding registration as a Professional Engineering Technologist in terms of the Engineering Profession Act, 2000;

"provincial director" means the provincial director as defined in regulation 1 of the General Administrative Regulations, 2003;

"scaffold" means a temporary elevated platform and supporting structure used for providing access to and supporting workmen or materials or both;

"shoring" means a system used to support the sides of an excavation and which is intended to prevent the cave-in or the collapse of the sides of an excavation;

"structure" means-

- 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, bulk mixing plant, pylon, surface and underground tanks, earth retaining structure or any structure designed to preserve or alter any natural feature, and any other similar structure;
- any falsework, scaffold or other structure designed or used to provide support or means of access during construction work; or

- any fixed plant in respect of construction work which includes installation, commissioning, decommissioning, or dismantling and where any construction work involves a risk of a person falling;

"support work" means the temporary structure erected to support the formwork before the casting of a concrete element of a structure.

"suspended platform" means a working platform suspended from supports by means of one or more separate ropes from each support;

"temporary works" means any falsework, formwork, support work, scaffold, shoring or other temporary structure designed to provide support or means of access during construction work;

"the Act" means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);

"tunnelling" means the construction of any tunnel beneath the natural surface of the earth for a purpose other than the searching for or winning of a mineral.

Reference should be made to the following documentation in conjunction with this Safety Specification (including existing surveys, drawings, and reports):

Available Drawings *Refer to Tender drawing.*

IMPORTANT NOTE:
This Health and Safety Specification has been prepared to comply with the requirements of the Construction Regulations 2014.

1.2 BACKGROUND TO THE HEALTH AND SAFETY SPECIFICATION

Historically, the Construction Industry has had a poor health and safety record. Due to the complex and potentially dangerous operations being undertaken, there is a high risk of incidents, accidents, and injuries. In many instances poor adherence to the Act and Regulations has resulted in severe consequences for Health and Safety performance. The Client is determined that the highest Health and Safety standards will prevail throughout the Contract and that there will be full commitment from all parties involved.

To achieve this goal the Client has arranged for the preparation of this Health and Safety Specification. The Health and Safety Specification sets out guidelines and minimum levels of awareness and guidance for Health and Safety requirements for the project. Contractual responsibility for adhering to these requirements rests with the Contractors. All employees are encouraged to be pro-active in compliance.

The Client is committed to ensuring the highest Health and Safety standards for all work undertaken within the Contract.

Contractors as employers are fully responsible and accountable for compliance with all Health and Safety requirements.

IMPORTANT NOTE:

Compliance with the Occupational Health and Safety Act and Regulations shall not be limited to this Health and Safety Specification and definitions contained in this document.

Contractors shall be conversant with the requirements and effects of Health and Safety legislation upon their activities, in particular the Construction Regulations, 2014, and the Occupational Health and Safety Act, 1993, and to have made adequate resource in their tender submission to comply with all legislative requirements.

Failure to comply with the requirements of this Safety Specification will result in severe sanction and the severity of the sanction will depend on the severity of the noncompliance.

The Contractor's personnel will be responsible for the auditing of the implementation of the Health and Safety Specification and maintaining the document control and record systems associated with the Health and Safety Specification. The Client will arrange for Health and Safety audits to be conducted on site on their behalf to monitor health and safety compliance by contractors.

1.3 PURPOSE OF THE HEALTH AND SAFETY SPECIFICATION

The purpose of this site-specific Health and Safety Specification is to comply with legal requirements and to provide health and safety information about specific project risks known by the Client, Designer and Safety Agent to be applicable to this project. This document also provides minimum health and safety requirements, standards, and expectations that the contractor must adhere to.

The Contractor must take into account all information in this specification and ensure that their tenders include adequate resource and competence to deal with the matters detailed herein so that all relevant contents are dealt with in a way which is in compliance with legislation and the ethical concerns for the safeguarding of employees, contractors and other persons affected by the construction activities. Please note that a detailed OHS bill of quantities must be provided by the contractor on all Construction Work Permit projects. The Bill of Quantities will form part of the Construction Work Permit appellation presented to Department of Labour for approval.

The Health and Safety Specification will be implemented during construction of the works and any construction activity that the Client has control over.

This will also assist in ensuring that all the costs related to the compliance with Occupational Health Act 85 of 1993 and the Construction Regulations 2014, as well as this Health and Safety Specification, are taken into consideration at Tender stage.

No advice, approval of any document required by the Health and Safety Specification such as hazard identification and risk assessment action plans or any other form shall be construed as an acceptance by the Client of any obligation that absolves the Contractor from achieving the required level of performance and compliance with legal requirements.

Further, there is no acceptance of liability by the Client which may result from the Contractor failing to comply with the Health and Safety Specification unless the Client has issued an instruction to any requirement, i.e. the Contractor remains responsible for achieving the required performance levels.

1.4 IMPLEMENTATION OF THE HEALTH AND SAFETY SPECIFICATION

This Health and Safety Specification forms an integral part of the Contract, and Contractors shall make it an integral part of their Contracts with other Contractors and Suppliers. Contractors employed by the Client are to ensure that the provisions of the Health and Safety Specification are applied both on the site and in respect of all off site activities relating to the project, in particular in transport activities and project dedicated off site fabrication works.

The Contractor shall enforce the provisions of the Health and Safety Specification amongst all Contractors and suppliers for the project.

The Contractor shall sign the acknowledgment on the last page of this safety specification that he/she has familiarized him/herself with the content of the Health and Safety Specification and shall comply with all obligations in respect thereof.

The successful Contractor will be required to compile a Health and Safety Plan based on the requirements of the Occupational Health Act 85 of 1993 and these Specifications, which will need to be approved by Client (or their appointed safety agent) prior to commencement with construction work.

1.4.1 Client Duties

In terms of the Construction Regulations 2014 the Client (or their Agent, where appointed) has legal duties. Where an Agent (refer to "definitions" section of this document) is appointed in terms of this project, these Health and Safety duties assigned will also apply.

All references to "Client" will apply to their appointed "Safety Agent", where so appointed, in this Health and Safety Specification.

The Client must:

- Prepare a baseline risk assessment for the construction work
- Prepare a suitable, sufficiently documented, and coherent site specific Health and Safety specification for the intended construction work, based on the baseline risk assessment
- Include the health and safety specification in the tender documents
- Ensure that potential principal contractors submitting tenders have made adequate provision for the cost of health and safety measures
- Ensure that the principal contractor to be appointed has the necessary competencies and resources to carry out the construction work safely
- Take reasonable steps to ensure co-operation between all contractors appointed by the Client to enable each of those contractors to comply with the regulations
- Ensure, before work commences, that every 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)
- Appoint each principal contractor in writing for the project, or part thereof
- Discuss and negotiate with the principal contractor the contents of the principal contractor's safety plan and thereafter finally approve that plan for implementation
- Ensure that a copy of the principal contractor's health and safety plan is implemented and maintained
- Ensure that periodic health and safety 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
- Ensure that a copy of the health and safety audit report is provided to the principal contractor within 7 days after the audit
- 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 principal contractor's health and safety plan for site
- Where changes are brought about to the design or construction work, make sufficient health and safety information and appropriate resources available to the principal contractor to execute the work safely
- Ensure that the health and safety file is kept and maintained by the principal contractor.
- Where the Client requires additional work to be performed as a result of a design change or 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.
- Where more than one principal contractor is appointed, the Client must take reasonable steps to ensure co-operation between all principal contractors and contractors to ensure compliance with the Regulations
- Where the Client has appointed a Safety Agent for the project, their details for this project are contained in the Project Directory section of this health and safety specification.

1.4.2 Designer Duties

It must be noted that the Designer also has Health and Safety duties assigned in terms of the Construction Regulations. Where the contractor fulfils a design function in terms of this project (refer to "definitions" section of this document), these duties will also apply. Please refer to Regulation 6 of the Construction Regulations 2014.

Please note that the designer of temporary works must ensure that:

- all temporary works are adequately designed so that it will be capable of supporting all anticipated vertical and lateral loads that may be applied;
- 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;
- 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
- the loads caused by the temporary works and any imposed loads are clearly indicated in the design.

1.5 PROJECT DIRECTORY		
Project Client **Contact Person**	**Eastern Cape Department of Health** Bhisho, Eastern Cape 5605 **Noluthando Mcopele**	**Tel:** 040 608 1175 **e-mail:** Noluthando.mcopele@echealth.gov.za **Cell:** 083 378 2014
Civil and Structural Engineer / Principal Agent **Contact Person**	**CSE Consulting (Pty) Ltd** 7B Derby Road, Berea, East London, 5241 **Clene' van Wyk**	**Tel:** 043 726 3565 **Cell:** 082 558 3889 **Fax:** 086 240 4464 **e-mail:** el@cse-consult.co.za
Project Leader **Contact Person**	**Carifro** 6 Belgrave Rd, Belgravia, East London, 5201 L Nkonki	**Tel:** 043 743 8266 **e-mail:** likhaya@carifro.com
Electrical and Mechanical Engineers **Contact Person**	**Carifro** 6 Belgrave Rd, Belgravia, East London, 5201 L Mkoka	**Tel:** 043 743 8266 **e-mail:** lizalisa@carifro.com
Construction Safety Agent **Contact Person**	**Safe Working Practice East London** 4 Essex Road Vincent, East London, 5241 Jayesh Bhana	**Tel:** 043 735 1774 **Fax:** 086 720 1149 **Cell:** 084 479 2294 **e-mail:** buffalo@safepractice.co.za

OTHER PARTIES DIRECTORY	
Department of Labour for submission of Annexure 1: Notification of Construction Work Private Bag X9084 East London 1200 **Contact Name:** Mr K Nkanjeni	**Tel:** 043 702 7533 **Fax:** 086 622 7119 **e-mail:** kulungile.nkanjeni@labour.gov.za
Department of Labour Shop 13 Bungalow Mall, Merriman St, Butterworth, 4960, Eastern Cape, South Africa	**Tel:** 047 491 0656 **Fax:** 047 491 0878
Telecommunications Contractor to refer all queries on location and nature of existing services to the Project Manager / Client, etc. **OR** Contractor to apply for and refer to way leave information from service providers for the nature and location of services. Refer all queries Project Manager. **Company:** Telkom **Contact Name:**	**Tel:** 10212 **e-mail:** **Cell:**
Water **Company:** Mnquma Local Municipality Butterworth, Eastern Cape, South Africa, 5200 **Contact Name:** Customer Care	**Tel:** 047 401 2400 **Fax:** 047 491 0195 **e-mail:** customercare@mnquma.gov.za
Electricity **Company:** Mnquma Local Municipality Butterworth, Eastern Cape, South Africa, 5200 **Contact Name:** Customer Care	**Tel:** 047 401 2400 **Fax:** 047 491 0195 **e-mail:** customercare@mnquma.gov.za
COVID-19 Hotlines **National Coronavirus Hotline** **Provincial Coronavirus Hotline (Eastern Cape)** **Coronavirus Support WhatsApp Group**	**Tel:** 0800 029 999 **Tel:** 0800 032 364 **WhatsApp:** 060 012 3456

1.6 PROJECT DETAILS

Description of Works

Civils

Wastewater Treatment Plant

The concrete reactor and underground pipework have been substantially completed under a previous contract, but the following components are required to complete the installation under this contract, including the commissioning of the plant:
The following is required to complete the 150m3/day activated sludge; extended aeration sewage treatment works:

- Civil works, e.g. trenching for pipework and cabling.
- Construction of earth wall in existing pond.
- Stormwater protection, lined channels, and walkways.
- Completion of existing pump house and other small buildings by finishing off, painting etc.
- Minor building works, e.g. chasing, concrete plinths for mechanical equipment.

Water Purification Plant

- A new water purification plant with a capacity of 15m3/h must be installed and commissioned, while the existing system plant is kept operational.
- The existing storage facilities must also be augmented by the installation of prefabricated steel reservoir on ground level with a capacity of 250m3.
- The pipework in and around the new treatment works must be modified to suit the new system and jockey pumps must be installed to connect the existing storage facilities into the raw water system.
- A new plant room must be constructed to house the some of the components of the new purification plant and also the smaller jockey pumps and future fire pumps.

Rehabilitation of Protection of Existing Dam

- The embankment and spillway of the existing earth fill dam is eroded and must be reinstated by protecting with new riprap, gabion baskets and "Renno" mattresses.
- The access of animals to the dam must be limited by erection of vermin proof fencing around the dam and the creation of access points for the watering of animals.

Mechanical and Electrical :

Wastewater Treatment Plant

The concrete reactor and underground pipework have been substantially completed under a previous contract, but the following components are required to complete the installation under this contract, including the commissioning of the plant:
The following is required to complete the 150m3/day activated sludge, extended aeration sewage treatment works:

- All pipework for low pressure air lines including bubble diffusers.
- Scum removal system in the settling tank
- Connection of low-pressure air lines to fluid conveyance pipes for the air lift circulation and discharge pipes.
- Blowers with motors, and electrical switchgear.
- Chlorination equipment.
- All electrical installations, including area lighting and connection to the nearby existing LV room.
- Start-up, testing and commissioning of sewage treatment works.
- Training of the staff of the Department of Health.
- Sampling and testing of influent and effluent and reporting and record keeping.
- Operation and Maintenance of the Wastewater Treatment Plant, the Water Purification Plant and the recently completed raw water pump station at the nearby dam for a period of 12 month after Practical Completion. he O&M period falls within the 12month defects liability period.
- Fire detection and fire hose reals inside hospital

Water Purification Plant

- A new water purification plant with a capacity of 15m3/h must be installed and commissioned, while the existing system plant is kept operational.
- The existing storage facilities must also be augmented by the installation of prefabricated steel reservoir on ground level with a capacity of 250m3.

- The pipework in and around the new treatment works must be modified to suit the new system and jockey pumps must be installed to connect the existing storage facilities into the raw water system.

Anticipated Construction Duration
Civils: 18 Months
Mechanical and Electrical: 18 Months

Construction Work Permit Required for the Project?
Yes

1.7 EXISTING ENVIRONMENT

Hazards particular to this project by virtue of location:

1. Members of the public.
2. Hospital Staff and Patients.
3. Road Users.
4. Project exposure to on site.

Overhead, Above Ground and Underground Services crossing the site:

Overhead: Yes, Electricity

Underground: Yes, Water, Electricity and Sewer

Ground level: Yes, Water and Electricity

Service Drawings available: Yes

Way leaves required: Yes

Permits required: Hot work permits, if required

Isolations required: Yes, Water and Electricity

Existing structures on site and surrounding land use (with a significant impact on Health & Safety):

Existing Services:

Existing services are shown on drawings or will be pointed out to the contractor before work commences. The contractor must then locate, mark, and protect the existing services to avoid damage to the services during construction.

The contractor must take all precautions against damaging existing services and will be held responsible for the consequences of breakages or disruptions.

Stormwater and ingress of water:

The contractor is deemed to have made provision for the control of stormwater and the ingress of water into underground in his rates and prices. He must construct temporary control measures like berms, temporary drainpipes etc. to control the inflow of water into excavations and construction areas.

Ingress of water into the subgrade must be controlled and minimized as far as possible as this will negatively impact on progress when the subgrade is inundated.

It is highlighted that the area where the new Water Purifications Plant, Plant Room, New Fire Storage Tank and connecting pipework is to be constructed is saturated due to the uncontrolled discharge from the existing settling tank. Therefore, the new 160Φ sludge discharge pipe to the sewage treatment ponds must be installed as a matter of priority.

Setting out of Works:

The Contractor must employ a qualified Land Surveyor to set out the important features of the works from the given survey benchmarks.

The Engineer will provide the co-ordinates of some key points for setting out of the works from where the Contractor must set out the detail of the works.

Existing ground conditions and ground survey report:

The site is on the premises of an existing rural fully functioning hospital.

The terrain is underlain by sandstones and mudstones of the Beaufort Group, Karoo sequence with dolerite intrusions in places.

Most excavations on site will be in silty and clayey soil that can be excavated by hand. Bedrock depth vary across the site and is at surface level in places.

The area is in the summer rainfall region, with an average annual rainfall of approximately 950mm, with maximum summer temperatures in the mid 30°C range and minimum winter temperatures in the mid 10°C range.

The nearby dam from which the water to the hospital is pumped can only be reached across jeep-track which become difficult to traverse under wet conditions. The topography around the dam area is relatively steep and is difficult to reach in places.

Existing Traffic Systems

Condition: Existing DR (Dirt Road / Gravel Road) traffic rules apply.

Restrictions to access: Access will be restricted during construction phase.

Speed restrictions: 20 – 40km/h

1.8 AVAILABLE DRAWINGS

Refer to drawings documentation.

1.9 PROJECT HEALTH AND SAFETY REQUIREMENTS

Significant health and safety hazards identified by Client, Designer and Safety Agent:

Contaminated Land
COVID-19
Demolition
Excavations
Fire
Flammable Liquids / Gas
Fragile Materials
Hazardous Substances
Hot Works
Members of Public
Overhead Services (Working near)
Road Working – in or next to (including Traffic Management)
Underground Services
Working at Height
Working with Effluent

Other construction hazards that the contractor can reasonably expect are as follows:

Bricklaying
Brush cutting
Bulk Mixing
Chainsaw Use
Compacting and Filling
Compactor Operations
Cutting Kerbs
Cutting Off Disc
Electric Tools and Electrical Installations
Hand tools
Manual Handling of General Items
Noise and Dust
Painting
Paving (Laying)
Plant/Vehicle and Equipment Operation
Plastering
Plumbing
Scaffold Erection / Dismantling
Shuttering Walls, Beams, Columns
Site Strip
Temporary Work (include False Work, Formwork, Support Work Scaffold and Shoring)
Working at Height (excluding scaffold)

NOTE: Please refer to end of this Health and Safety Specification for the baseline risk assessment for these hazards and risks.

ACTIVITIES REQUIRING APPROVED METHOD STATEMENTS (FOR HEALTH AND SAFETY)

1. Site establishment
2. Emergency Procedures
3. Consequence Management

ACTIVITIES REQUIRING PERMITS (FOR HEALTH AND SAFETY PURPOSES)

Permit to Dig: Yes

Permit to Enter Excavations: Yes

Road Works Permit: No

Permit to Work with Electricity: Yes

Confined Space Permit: No

Hot Works Permit: Yes

Permit to Work under Power Lines: Yes, if required

Blasting: No

Client issued permit for work in restricted areas: No

Temporary Works: Yes

CONTRACTOR SAFETY PERSONAL

CONTRACTOR SAFETY MANAGER PROVISION

Records of safety audits undertaken by the Contractor's Safety Officer must be inspected by the Safety Manager on site and non-conformances reported by the Safety Officer to the Health and Safety manager. All non-conformances identified by the Safety Officer and Client's Safety Agent must be investigated and corrective action taken by the Safety Manager to prevent re-occurrence.

Please note that as from 7th August 2018 the safety manager must be professionally registered with the SACPCMP. Proof of registration with the SACPCMP must be provided.

The requirement for this site is that a part time safety manager be appointed by the Contractor. Part time Safety Manager must visit site at least fortnightly.

CONTRACTOR SAFETY OFFICER PROVISION

Records of safety audits undertaken by the Contractor's Safety Officer must be kept on site in the safety file and nonconformances reported by the Safety Officer to the Contractor's management team. All nonconformances identified by the Safety Officer and Client's Safety Agent must be investigated and corrective action taken by the Contractor to prevent re-occurrence.

Please note that as from 7th August 2018 the safety officer must be professionally registered with the SACPCMP. Proof of registration with the SACPCMP must be provided.

The requirement for this site is that a full time Safety Officer be appointed by the Contractor.

HEALTH AND SAFETY REPRESENTATIVE PROVISION

A full time Health and Safety representative must be appointed before the start of the project.

MEDICAL CERTIFICATE OF FITNESS (ANNEXURE 3)

The contractor must ensure that their employees on site have a valid medical certificate of fitness, specific to the construction work being performed, issued by an occupational health practitioner in the form of an Annexure 3 template.

Please ensure that all Plant Machinery Operators have proof of drug test conducted.

MANAGEMENT AND SUPERVISION OF CONSTRUCTION WORK

A principal contractor must, in writing, appoint one full-time competent person as the construction manager with the duty of managing all the construction work on a single site, including the duty of ensuring occupational health and safety compliance, and in the absence of the construction manager an alternate competent person must be appointed by the principal contractor. Proof of an all-inclusive assessment by the Principal Contractor of the Construction Manager's Competency in construction management and health and safety competency must be available in the Safety File.

The Construction Manager, Alternate Construction Managers, Assistant Construction Managers, and designated construction supervisor/s must, as a minimum, have training in Legal Liability, Construction Regulation 2014 and the OHS Act and Regulations.

TRAFFIC MANAGEMENT AND TRAFFIC SAFETY OFFICER PROVISION

The Traffic Management Plan must be approved by the Project Manager and, as required, the Traffic Chief as per the National Road Traffic Act, No. 93 of 1996. The Traffic Safety Officer must have training as per Unit Standard 14561 or similar.

Traffic Safety Officer is not required, however flagman's must be appointed in writing to control truck deliveries of materials to site.

ENVIRONMENTAL CONDITIONS

Contractor must take into account adverse weather conditions on site activities and implement control measures to mitigate risk. This includes risk of exposure to excessive heat, cold, rain, lightning and wind. The open nature of the site works will not preclude any of the above.

ARRANGEMENTS FOR ACCESS, PARKING, DELIVERIES, ETC.

Access to site by Construction Vehicles: Construction vehicles will park at designated areas.

Access to site by Construction Workers and Visitors: Designated entrance will be monitored.

All service providers must sign a 37.2 Mandatory Agreement and must be inducted before they can be allowed on site.

ARRANGEMENTS FOR SITE CAMP, ABLUTIONS AND YARD, INCLUDING FOR COVID-19

Site camp location and set up

- **Restrictions / requirements:**
- **Storage areas:**
- **Security:**

} Contractor to advise in consultation with Engineer / Professional Team

Ablutions and Welfare Arrangements

Contractor to supply ablutions and facilities in line with the Construction Regulations 2014, refer to section 2.31 of this health and safety specification regarding the below. Toilets should be provided with built in

facilities for hand washing. Please note further that COVID-19 control measures form an important part of ablutions provision on site ref soap and water/hand sanitiser, signage, etc:

- **Toilets:** } } Contractor to provide as per Regulations
- **Washing facilities:** } }
- **Drinking Water:** } }
- **Shelter:** } } Contractor to provide as per Regulations

Mobile site facilities requirements:

A camping toilet/mobile toilet will be required for sites that cannot facilitate a permanent location for ablution units and must be available for each gender per location.

The use of a camping toilet must be prepared and setup correctly with additional anchors and available toiletries prior to each working day and to be first priority when changing location of works along a set working path.

Teams are to ensure that the toilets are cleaned correctly and suitable for easy and hygienic uses and recorded on a daily register.

PROTECTION OF SITE AGAINST UNAUTHORISED ACCESS BY PUBLIC

Excavation Fencing: Note that excavations accessible to public, or adjacent to public roads / thoroughfares, must have (1) barrier / fence of at least 1m in height, and (2) warning illuminants at night or when visibility is poor, or have other suitable precautionary measures if of both these are not practicable.

General Fencing of Site: Note that construction sites in built up areas adjacent to public walkway must be fenced off and have controlled access points with the correct signs to indicate the site office for any relevant enquiries.

Warning Notices: Warnings notices must be clearly and visibly displayed.

Look Outs: Look outs must be posted to warn members of the public.

PERSONAL PROTECTIVE EQUIPMENT (PPE)
The Client requires the Contractor to ensure that employees (and others under his/her control) wear the following minimum PPE:

Overalls: Yes, reflector overalls.

Safety Harnesses: Yes, if required.

Hard Hats: Yes

Reflective Vests: Yes

Goggles / gloves / ear defenders / respiratory protection: Yes

Safety Footwear: Yes, steel toe safety boots and gumboots if required.

Specialist Equipment (e.g. for confined Spaces): Not applicable

HAZARDOUS SUBSTANCES

The following materials and substances have, or may have, to be used in the works and are identified as potentially posing special health and / or safety hazards during the project. Appropriate measures will need to be specified for their control:

1. Petrol & Diesel
2. Cement
3. Sanitiser
4. Shutter Oil
5. Paint
6. Cleaning Detergents

1.10 INTERFACE AND RESTRICTIONS BY CLIENT

Contractor must note that the following Client activities will continue during construction:
The site is on the premises of an existing rural fully functioning hospital.

The following Client safety rules and/or requirements are to be observed:
All workers are to receive induction prior to commencement of work on site.
All employees and visitors will be screened before entrance to construction site.
Other safety rules and requirements to be advised at induction.

Restrictions on times, access or other restrictions by Client
No restrictions of times.
Other restrictions may be advised at induction.

1.11 Project Close Out

The Health and Safety files for the Principal Contractors and all Contractors require closure and handover to the Client at the completion of the project in the form of a consolidated safety file. The following list is an example of what should be included but is not exhaustive. The Safety Agent or the Client may require further information at the time of completion and the Principal Contractor is to ensure that all instructions are responded to. Documentation would include all health and safety related records from the start of the project. All records to be in hard copy or electronic format and submitted to the Safety Agent for approval in adequately formatted lists and folders. Layout should be logical and in the same order as in the site files.

Consolidated Health and Safety close out file requirements include:

- Health and safety specification (most recent version)
- Principal Contractor's health and safety plan/s
- Site safety organograms
- Legal appointments
- Notification to Department of Labour of commencement of work / Construction Work Permit
- Workman's Compensation Letters of Good Standing for the project
- Full safety files for all contractors as well as their close out reports
- List of all contractors who worked on site
- Letters of safety plan approval of contractors by the Principal Contractor
- Mandatory agreements (section 37.2 agreements)
- Incident and accident records / Occupational Disease records
- Contractor Non-conformance records
- Safety agent's audit reports
- Safety Officer reports

- Method Statements
- Risk assessments
- Safe work procedures
- Medical surveillance certificates of fitness. Medical records are to be kept according to the Occupational Health and Safety Act, as amended.
- All temporary works drawings (suspended beams/scaffolds, etc.)
- Copies of test results, policies, and procedures for environmental monitoring (silica, noise, dusts, etc.)
- Detailed registers of all material used
- Copies of all Checklists completed

1.12 SAFETY FILE RETURN TO CLIENT

The consolidated Health and Safety Files for the Project is to be handed over by the Principal Contractor to the Client upon Project Completion in either hard copy or electronic format.

1.13 NON-CONFORMANCE PENALTY

Should, at any time, the works, or part of the works, be stopped due to unsafe acts or non-compliance with the Clients or PCs H&S Plan; neither the PC nor any other Contractor shall have a claim for extension of time or any other compensation.

The following constitute examples of the types of non-conformances that will attract penalties:

Minor: Penalty: R50/count	**Medium: Penalty: R500/count and a non-conformance**	**Severe Penalty: R5000/count, a non-conformance and/or activity stoppage**
Non-use of PPE supplied	Toilets not supplied or regularly serviced; lack of drinking water	Contractors working without Health and Safety Plan approval
Non completion of registers for plant and equipment on site	Contractors not audited	Workers transported in contravention of the OHS plan or legal requirements
Lack of H&S signage at work areas	Working without training or the appropriate H&S method statements	Invalid Letters of Good Standing
Tools and equipment identified in poor condition during inspections	Legal non-conformances identified during the previous audit and not addressed within the agreed time frame	Non-compliance with traffic accommodation requirements: layout or physical conditions
	No monthly OHS report at site meeting to report on	Fall protection harness not tied off / not worn
	No certificates of fitness for workers as required	Any breach of legal requirements

2.0 FURTHER REQUIREMENTS

2.1 Duties of Principal Contractor / Contractor in terms of Construction Regulations 2014

A Principal Contractor must:

- 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, 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;

- 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 Safety 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 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 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 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's 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;

- discuss and negotiate with the contractor the contents of their health and safety plan and finally approve that plan for implementation;

- ensure that a copy of both the principal contractor and contractor's health and safety plan is available on request to an employee, an inspector, a contractor, the Client, or the Client's Safety Agent;

- hand over a consolidated health and safety file to the Client upon completion of the construction work, to include a record of all drawings, designs, materials used and other similar information concerning the completed structure;

- in addition to the documentation required in the health and safety file include and make available a comprehensive and updated list of all the contractors on site accountable to the principal contractor, the agreements between the parties and the type of work being done;

- 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.

A contractor must prior to performing any construction work-

- provide and demonstrate to the principal contractor a suitable and sufficiently documented health and safety plan, based on the relevant sections of the Client's health and safety specification and provided by the principal contractor, 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 contractor as work progresses;

- open and keep on site a health and safety file, which must include all documentation required in terms of the Act and these Regulations, and which must be made available on request to an inspector, the Client, the Client's Safety Agent or the principal contractor;

- before appointing another contractor to perform construction work be reasonably satisfied that the contractor that he or she intends to appoint has the necessary competencies and resources to perform the construction work safely;

- co-operate with the principal contractor as far as is necessary to enable each of them to comply with the provisions of the Act;

- as far as is reasonably practicable, promptly provide the principal contractor with any information which might affect the health and safety of any person at work carrying out construction work on the site, any person who might be affected by the work of such a person at work, or which might justify a review of the health and safety plan.

Where a contractor appoints another contractor to perform construction work, the duties that apply to the principal contractor will apply to the contractor as if he or she were the principal contractor.

A principal contractor must take reasonable steps to ensure co-operation between all contractors appointed by the principal contractor to enable each of those contractors to comply with these Regulations.

No contractor may allow or permit any employee or person to enter any site unless that employee or person has undergone health and safety induction training pertaining to the hazards prevalent on the site at the time of entry.

A contractor must ensure that all visitors to a construction site undergo health and safety induction pertaining to the hazards prevalent on the site and must ensure that such visitors have the necessary personal protective equipment.

A contractor must at all times keep on his or her construction site records of the health and safety induction training and such records must be made available on request to an inspector, the Client, the Client's Safety Agent or the Principal Contractor.

A contractor must 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 (a template of which can be found in the Construction Regulations, 2014).

2.2 Management and Supervision of Construction Work

A principal contractor must, in writing, appoint one full-time competent person as the construction manager with the duty of managing all the construction work on a single site, including the duty of ensuring occupational health and safety compliance, and in the absence of the construction manager an alternate must be appointed by the principal contractor. Proof of all-inclusive assessment of the Construction Manager's Competency in construction management and H & S competency must be available in the Safety File. The Construction Manager must, as a minimum, have a Construction Regulation course. No contractors may be left unsupervised on site by the principal contractor.

A principal contractor must upon having considered the size of the project, in writing appoint one or more assistant construction managers for different sections thereof: Provided that the designation of any such person does not relieve the construction manager of any personal accountability for failing in his or her management duties in terms of this regulation.

Where the construction manager has not appointed assistant construction managers, or, in the opinion of an inspector, a sufficient number of such assistant construction managers have not been appointed, that inspector must direct the construction manager in writing to appoint the number of assistant construction managers indicated by the inspector, and those assistant construction managers must be regarded as having been appointed.

No construction manager appointed in terms of the Regulations may manage any construction work on or in any construction site other than the site in respect of which he or she has been appointed.

A contractor must, after consultation with the Client and having considered the size of the project, the degree of danger likely to be encountered or the accumulation of hazards or risks on the site, appoint a full-time or part-time construction health and safety officer in writing to assist in the control of all health and safety related aspects on the site: Provided that, where the question arises as to whether a construction health and safety officer is necessary, the decision of an inspector is decisive.

No contractor may appoint a construction health and safety officer to assist in the control of health and safety related aspects on the site unless he or she is reasonably satisfied that the construction health and safety officer that he or she intends to appoint is registered with a statutory body approved by the Chief Inspector and has necessary competencies and resources to assist the contractor

A construction manager must in writing appoint construction supervisors responsible for construction activities and ensuring occupational health and safety compliance on the construction site. Proof of all-inclusive assessment of the Construction Supervisor's competency in construction supervision and H&S competency must be available in the Safety File. The Construction Supervisor must, as a minimum, have a supervision course as per Unit Standard 262845 (Civil Engineering), 119080 (Building Construction) and 262884 (Civil Engineering).

A contractor must, upon having considered the size of the project, in writing appoint one or more competent employees for different sections thereof to assist the construction supervisor, and every such employee has, to the extent clearly defined by the contractor in the letter of appointment, the same duties as the construction supervisor: Provided that the designation of such employee does not relieve the construction supervisor of any personal accountability for failing in his or her supervisory duties.

Where the contractor has not appointed such an employee, or, in the opinion of an inspector, a sufficient number of such employees have not been appointed, that inspector must instruct the employer to appoint the number of employees indicated by the inspector.

No construction supervisor appointed may supervise any construction work on or in any construction site other than the site in respect of which he or she has been appointed: Provided that if a sufficient number of competent employees have been appropriately designated on all the relevant construction sites, the appointed construction supervisor may supervise more than one site.

2.3 Construction Work Permit

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 on projects that will –

1. exceed 365 days and will involve more than 3600 person days of construction work; or

2. the tender value limit is grade 7, 8 or 9 of the Construction Industry Development Board (CIDB) grading.

- Grade 7 = R60 000 000
- Grade 8 = R 200 000 000
- Grade 9 = No limit

A client may appoint a Construction Health and Safety Agent or Construction Health and Safety Manager to apply for this permit from the Provincial Director and construction work may not commence until the permit has been issued by the Provincial Director.

A copy of this permit will be required to be kept in the principal contractor's safety file, and the site-specific number issued by the Provincial Director must be displayed at the site entrance.

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.

The following minimum documentation will be required during the permit application process:

- Signed copy of the Health and Safety Specification.
- Principal Contractor's Health and Safety Plan CR 5(1)(m)
- Baseline Risk Assessment CR 5(1)(a)
- Appointed Principal Contractor's Letter for Good Standing as per CR 5(1)(j)
- Principal Contractor's proof of CIBD registration
- Principal Contractor made adequate provision for the cost of health and safety measures (Bill of Quantities included in this tender) CR 5(1)(g)
- Proof of Principal Contractor's competency and resources to carry out the construction work safely CR 5(1)(h)
- Appointment Letter for Construction Manager, CV, Certificates, Proof of Legal liability training and List of projects
- Appointment Letter of Safety Officer, CV, Certificates and Safety Officer's Registration for SACPCMP
- Appointment Letter of Safety Managers; CV, Certificates and Safety Manager's Registration for SACPCMP
- Principal Contractor's Appointment Letter CR 5(1)(k) signed by both Client and PC
- 37.2 Mandatory Agreement signed by both Client and PC

After approval of the Construction Work Permit any changes made to the appointed persons on the annexure 1 must be submitted to Department of Labour for approval before the appointed persons are allowed to commence with their tasks.

PLEASE NOTE THAT THE CONSTRUCTION MANAGER (CR8(1) AND THE SAFETY OFFICER(CR8.5) NAMED ON THE CONSTRUCTION WORK PERMIT MUST BE THE SAME PERSON THAT ACTS AS THE CONSTRUCTION MANAGER AND SAFETY OFFICER ON SITE. IF THIS WILL NOT BE THE CASE FOR SOME REASON THEN THE SAFETY AGENT MUST BE NOTIFIED OF THE CHANGE BY THE PRINCIPAL CONTRACTOR AT LEAST 7 DAYS BEFORE THE CHANGE IS MADE SO THAT THE SAFETY AGENT CAN AMEND THE CONSTRUCTION WORK PERMIT APPLICATION AND ADVISE THE DEPARTMENT OF EMPLOYMENT AND LABOUR ACCORDINGLY

2.4 Assignment of Contractor's Responsible Persons to Manage Health and Safety on Site

The Contractor shall submit management and supervisory appointments as well as any relevant appointments in writing (as stipulated by the Construction Regulations 2014 and the Occupational Safety and Health Act 1993), prior to commencement of work (refer to **Annexure B** at the end of this Health and Safety Specification).

2.5 Competency for Contractor's Responsible Persons

The Contractor's responsible persons shall be competent in health and safety and be familiar with the Occupational Health and Safety Act 1993, and applicable regulations. Valid proof of pertinent health and safety courses attended by such persons will be required to be presented to the Client.

2.6 Compensation of Occupational Injuries and Diseases Act 130 of 1993 (COIDA)

The successful Contractor shall submit to the Client a valid letter of good standing with the Compensation Insurer prior to appointment.

2.7 Occupational Health and Safety Policy

The Contractor shall submit their Health and Safety Policy, prior to construction commencement, signed by the Chief Executive Officer. The Policy must outline objectives and how they will be achieved and implemented within the company operations. The Policy must be communicated to all employees and proof thereof must be available in the Safety File.

2.8 Health and Safety Organogram

The Contractor shall submit an organogram, prior to construction commencement, outlining the Health and Safety Site Team that will be assigned to the project, if successful with the tender. In cases where appointments have not been made, the organogram shall reflect the position. The organogram shall be updated when there is a change in the site team.

2.9 Risk Assessments

Baseline Risk Assessment

The Client shall cause a baseline risk assessment to be conducted by a competent person before the design process and tender process commence, and the assessed risks shall form part of the health and safety specifications.

The Contractor must, before commencement of any construction work, and during construction work, have risk assessments performed by a competent person appointed in writing, which risk assessments form part of the health and safety plan to be applied on the site and must include:

- The identification of the risks and hazards to which persons may be exposed to;
- An analysis and evaluation of the risks and hazards identified; based on a documented method
- A documented plan and applicable safe work procedures to mitigate, reduce or control the risks and hazards that have been identified;
- A monitoring plan; and
- A review plan

The Contractor must ensure that, as far as is reasonably practicable, ergonomic related hazards are analysed, evaluated, and addressed in a risk assessment.

The Contractor must ensure that all employees under his control are informed, instructed and trained by a competent person regarding any hazard and the related work procedures and/or control measures **before any work commences** and thereafter **at the times determined in the risk assessment monitoring and review plan of the relevant site.**

The Principal Contractor must ensure that all contractors are informed regarding any hazard that is stipulated in the risk assessment **before any work commences** and thereafter **at the times determined in the risk assessment monitoring and review plan of the relevant site.**

The Contractor must consult with the health and safety committee or with a representative trade union or representative group of employees if no health and safety committee exists, on the monitoring and review of the risk assessments for the site.

The Contractor must ensure that copies of risk assessment for this site are available on site for inspection purposes by interested parties (inspector, the Client, Client's Safety Agent, any contractor, any employee, a representative trade union, a health and safety representative or safety committee member.

A Contractor must review the relevant risk assessment where changes are effected to the design and/or construction that result in a change to the risk profile, or when an incident has occurred.

Preventative measures must first address the elimination of the hazard or risk. Should PPE be required to reduce risk, the equipment or clothing to be used must be SABS approved.

In general, the Contractor must ensure that the Risk Assessment involves identifying the hazards present in a work activity on site. This is followed by an evaluation of the extent of the risk involved taking into account those precautions already being taken.
The following general principle should be followed when conducting a risk assessment:

- All relevant risks and/or hazards should be systematically addressed;
- The risk assessment should address what actually happens in the workplace during the work activity;
- All employees and those who may be affected must be considered, including maintenance staff, security guards, visitors, and Contractors;
- The risk assessment should highlight those groups and individuals who may be required to work alone or who have disabilities;
- The risk assessment process should take into account the existing safety measures and controls.
- The level of detail on a risk assessment should be appropriate to the level of risk.

2.10 Health and Safety Representative(s)

The Contractor shall ensure that Health and Safety Representative(s) is/are elected and trained to carry out his / her functions. The Safety Representative(s) must be democratically nominated, elected, and appointed in writing. The Health and Safety Representative(s) shall carry out regular inspections, keep records and report to the supervisor to take appropriate action. The Safety Representative(s) shall attend Health and

Safety Committee Meetings. The Health and Safety Representative shall be part of the team that will investigate incidents, accidents, and non-conformances. The Safety Representative(s) must be (a) full time employee(s) who is/are acquainted with conditions and activities at that workplace or section thereof. The Safety Representatives must have Safety Representative training and must be capable of performing their duties.

2.11 Health and Safety Committee

Where two or more health and safety representatives have been appointed on site, the Contractor shall ensure that monthly health and safety meetings are held with such representatives and minutes are kept on record. Meetings must be organized and chaired by the Contractor's Health and Safety Committee Chairperson. Minutes of these meetings must be available for the employees of the contractor to refer to.

PLEASE NOTE THAT THE SAFETY AGENT MAY REQUIRE THAT THE PRINCIPAL CONTRACTOR CONVENES A SAFETY COMMITTEE MEETING ON SITE IN THE INTERESTS OF HEALTH AND SAFETY ON SITE. SUCH COMMITTEE MEETING MAY REQUIRE ATTENDANCE OF CONTRACTORS SAFETY OFFICERS/SAFETY REPRESENTATIVES, CONSTRUCTION SUPERVISION AND THE SAFETY AGENT.

2.12 Medical Certificate of Fitness

The contractor must ensure that their employees on site have a valid medical certificate of fitness, specific to the construction work being performed, issued by an occupational health practitioner in the form of an Annexure 3 template (refer to the Construction Regulations 2014 on the Department of Labour website for a sample of this form).

Employees required to perform work at heights or from fall risk position must be medically fit to perform such work, such employee's medicals must specify "Fall Risk" or "Working at heights" in the exposure section of the annexure 3 template.

2.13 Health and Safety Training

The Contractor shall quarterly conduct a training needs analysis to ascertain what health and safety training is required. A plan of action should be devised and forwarded to the Client for records. Once the identified people have attended the training, the Contractor must provide the Client with copies of certificates obtained.

2.13.1 Induction

No Contractor may allow or permit any employee or person to enter site unless they have undergone health and safety induction training pertaining to the hazards prevalent on site at the time of entry. This includes visitors to site. The Contractor must ensure that visitors to site have the necessary protective equipment (PPE). A copy of attendance registers of all employees who attend inductions shall be kept.

2.13.2 *Awareness*

The Contractor shall conduct periodic toolbox talks on site, weekly or before any hazardous work takes place. The talks shall cover the relevant activity and an attendance register must be signed by all attendees. This record of who attended and the content of the topic will be kept on the site health a safety file as evidence of training.

2.14 Competency

After the Contractor has identified the training to be conducted as part of the competency requirement, and based on Risk Assessment, he shall send the relevant persons on appropriate courses and keep certificates of training for reference. Familiarity with the Health and Safety Act and Regulations is an integral part of the

definition of competence. All training must be conducted by an accredited training provider and the certificates must display the applicable unit standards and the expiry dates thereof.

2.15 General Record Keeping

The Contractor shall keep and maintain Health and Safety records to demonstrate compliance with the Health and Safety Specification and the Occupational Health and Safety Act. The contractor shall ensure that all records of incidents, spot fines, training, etc. are kept on site. All documents shall be available for inspection by the Client, or the Department of Labour's Inspectors.

2.16 General Inspection, Monitoring and Reporting

The Contractor shall carry out inspections as required by this Health and Safety Specification, as well as by health and safety legislation.

2.17 Emergency Procedures

The Contractor shall submit a detailed Emergency Procedure for approval by the Client prior to commencement on site. The procedure shall detail the response plan including the following:

- List of key personnel;
- Details of emergency services;
- Actions or steps to be taken in the event of the emergency; and
- Information on hazardous materials / situations, including each material's hazardous potential impact or risk on the environment or human and measures to be taken in the event of an accident.

Emergency procedure(s) shall include, but shall not be limited to, fire, spills, accidents to employees, use of hazardous substances, dangers as a result of riot / service delivery protests / intimidation, etc. The Contractor shall advise the Client in writing of any on-site emergencies, together with a record of action taken, within 24 hours of the emergency occurring. A contact list of all service providers (Fire Department, Ambulance, Police, Medical and Hospital, etc.) must be maintained and available to site personnel.

2.18 First Aid Box and First Aid Equipment

The Contractor shall provide first aid box/es and appoint, in writing, First Aider(s) for this project in line with the results of the Contractor's risk assessment for the project, this health and safety specification as well as the provisions of the General Safety Regulations. The appointed First Aider(s) are to be sent for accredited first aid training before starting on site. Valid certificates are to be kept on site.

- First Aid box/es must be adequately stocked at all times, accessible and be controlled by a qualified First Aider.
- Perishables to be checked and replaced when expired.
- Stock per content list as per the General Safety Regulations Annexure.
- Signage to be in place.
- To be numbered and sealed with name of first aider on or above the First aid box.
- Dressing logbook to be available in the first aid box.
- If more than 5 employees are present, there must be a first aid box available.
- Register to be checked by a competent person.

If required by the Client, the Contractor shall have a stretcher on site to be used in case of a serious incident.

2.19 Accident / Incident Reporting and Investigation

The Contractor shall, in addition to the prescribed requirements of the Occupational Health and Safety Act and General Safety Regulations, investigate, record, and report all Section 24 reportable incidents to the

Client within 24 hours of the incident occurring. Incident investigations shall be conducted by the Contractor's appointed Accident Investigator – this Investigator must be a competent person or persons who have sufficient knowledge to carry out an investigation.

In the event of a fatality or a permanent disabling injury the Contractor must submit proof of reporting of incident to Department of Labour as well as proof of preventative measures to the Client. The Client reserves the right to conduct investigations into any incidents that they deem fit and the Contractor is required to provide full co-operation in this regard.

2.20 Hazards and Potential Situations

The Contractor shall immediately notify other Contractors of any hazardous or potentially hazardous situations, which may arise during performance of the activities.

2.21 Occupational Health and Safety Signage

The Contractor shall ascertain and provide adequate on site health and safety signage. This signage shall include, but shall not be limited to, Hard Hat / Helmet Area; Safety Shoes to be worn on site; Dust Masks to be worn in areas where there might be exposure to excessive dust; Ear Plugs / Muffs to be worn where there might be noise exposure over 85 dB; Gloves; Safety Goggles; Safety Harness, Workers in Excavation, traffic management, etc. The Contractor shall be responsible to maintain the quality and replacement of signage. Signage must comply with the requirements of SABS.

2.22 Management of Contractors by Principal Contractor

The Principal Contractor shall ensure that all contractors under his control are complying with the respective Health and Safety Plans, as well as Health and Safety Legislation.

2.23 Stacking of Materials

In addition to the provisions for the stacking of articles in the General Safety Regulations, 2003, the contractor must ensure that –

- a competent person is appointed in writing with the duty of supervising all stacking and storage on a construction site;
- adequate storage areas are provided;
- there are demarcated storage areas; and
- storage areas are kept neat and under control.

2.24 Housekeeping and General Safeguarding on Construction Sites

A contractor must, in addition to compliance with the Environmental Regulations for Workplaces, 1987, promulgated by Government Notice No. R. 2281 of 16 October 1987, ensure that suitable housekeeping is continuously implemented on each construction site, including-

- the proper storage of materials and equipment;
- the removal of scrap, waste and debris at appropriate intervals;
- ensuring that materials required for use, are not placed on the site so as to obstruct means of access to and egress from workplaces and passageways;
- ensuring that materials which are no longer required for use, do not accumulate on and are removed from the site at appropriate intervals;

- ensuring that waste and debris are not disposed of from a high place with a chute, unless the chute complies with the requirements set out in the regulations;
- ensuring that construction sites in built-up areas adjacent to a public way are suitably and sufficiently fenced off and provided with controlled access points to prevent the entry of unauthorized persons; and
- ensuring that a catch platform or net is erected above an entrance or passageway or above a place where persons work or pass under or fencing off the danger area if work is being performed above such entrance, passageway, or place so as to ensure that all persons are kept safe in the case of danger or possibility of persons being struck by falling objects.

2.25 Construction Vehicles and Mobile Plant

A contractor must ensure that all construction vehicles and mobile plant-

- are of an acceptable design and construction;
- are maintained in a good working order;
- are used in accordance with their design and the intention for which they were designed, having due regard to safety and health;
- are operated by a person who-
  - has received appropriate training, is certified competent and in possession of proof of competency and is authorised in writing to operate those construction vehicles and mobile plant;
  - has a medical certificate of fitness that includes a five (5) panel drug test, to operate those construction vehicles and mobile plant, issued by an occupational health practitioner in the form of Annexure 3.
- have safe and suitable means of access and egress;
- are properly organized and controlled in any work situation by providing adequate signalling or other control arrangements to guard against the dangers relating to the movement of vehicles and plant, in order to ensure their continued safe operation;
- are prevented from falling into excavations, water, or any other area lower than the working surface by installing adequate edge protection, which may include guard-rails and crash barriers;
- are fitted with structures designed to protect the operator from falling material or from being crushed should the vehicle or mobile plant overturn;
- are equipped with an acoustic warning device which can be activated by the operator;
- are equipped with an automatic acoustic reversing alarm;
- are equipped with fire extinguishers (2.5 – 4.5 kg); and
- are inspected by the authorised operator or driver on a daily basis using a relevant checklist prior to use and that the findings of such inspection are recorded in a register kept in the construction vehicle or mobile plant.

A contractor must ensure that-

- no person rides or is required or permitted to ride on a construction vehicle or mobile plant otherwise than in a safe place provided thereon for that purpose;
- every construction site is organized in such a way that, as far as is reasonably practicable, pedestrians and vehicles can move safely and without risks to health;
- the traffic routes are suitable for the persons, construction vehicles or mobile plant using them, are sufficient in number, in suitable positions and of sufficient size;
- every traffic route is, where necessary, indicated by suitable signs;
- all construction vehicles and mobile plant left unattended at night, adjacent to a public road in normal use or adjacent to construction areas where work is in progress, have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, in order to identify the location of the vehicles or plant;
- all construction vehicles or mobile plant when not in use, have buckets, booms, or similar appendages, fully lowered, or blocked, controls in a neutral position, motors stopped, wheels chocked, brakes set, and ignition secured;
- whenever visibility conditions warrant additional lighting, all mobile plant are equipped with at least

two headlights and two taillights when in operation;
- tools, material, and equipment are secured and separated by means of a physical barrier in order to prevent movement when transported in the same compartment with employees;
- vehicles used to transport employees have seats firmly secured and adequate for the number of employees to be carried; and
- all construction vehicles or mobile plant travelling, working, or operating on public roads comply with the requirements of the National Road Traffic Act, 1996.
- all plant and vehicles are be fitted with amber rotating beacons and reverse alarms.
- all construction site vehicles must be inspected daily especially if it has dangerous "items" (fuel, explosives, etc.) on vehicle, completed inspection registers must also be available for inspection.
- the vehicles must resemble the original manufacturer's product. Levers, alarms, and amber lights to be fitted to construction vehicle for notification of vehicle.
- fire extinguishers, signage, and licence disc to be correctly mounted and displayed.
- when the vehicle is stationary no key to be left in or on vehicle or plant.
- Drip tray must be present when stationary.

2.26 Electrical Installations and Machinery on Construction Sites

A contractor must, in addition to compliance with the Electrical Installation Regulations and the Electrical Machinery Regulations, ensure that –

- before construction commences and during the progress thereof, adequate steps are taken to ascertain the presence of and guard against danger to workers from any electrical cable or apparatus which is under, over or on the site;
- all parts of electrical installations and machinery are of adequate strength to withstand the working conditions on construction sites;
- the control of all temporary electrical installations on the construction site is designated to a competent person who has been appointed in writing for that purpose;
- all temporary electrical installations used by the contractor are inspected at least once a week by a competent person and the inspection findings are recorded in a register kept on the construction site; and
- all electrical machinery is inspected by the authorized operator or user on a daily basis using a relevant checklist prior to use and the inspection findings are recorded in a register kept on the construction site.

2.27 Use and Temporary Storage of Flammable Liquids on Construction Sites

A contactor must, in addition to compliance with the provisions for the use and storage of flammable liquids in the General Safety Regulations, 2003, ensure that –

- where flammable liquids are being used, applied, or stored at the workplace concerned, it is done in a manner that does not cause a fire or explosion hazard, and that the workplace is effectively ventilated;
- no person smokes in any place in which flammable liquid is used or stored, and the contractor must affix a suitable and conspicuous notice at all entrances to any such areas prohibiting such smoking;
- an adequate amount of efficient fire-fighting equipment is installed in suitable locations around the flammable liquids store with the recognized symbolic signs;
- only the quantity of flammable liquid needed for work on one day is taken out of the store for use;
- all containers holding flammable liquids are kept tightly closed when not in actual use and, after their contents have been used up, are removed from the construction site and safely disposed of;
- where flammable liquids are decanted, the metal containers are bonded and earthed; and
- no flammable material, including cotton waste, paper, cleaning rags or similar material is stored together with flammable liquids
- proper containers are to be used for fuel. Marked and labelled as per the content.

- diesel on site; more than 800 litres must have a certificate, fire safe certificate. Locked in a ventilated, secure area with a drip tray and have a designated, responsible person to use it.

2.28 Water environments

A contractor must ensure that where construction work is done over or in close proximity to water, provision is made for –

- preventing persons from falling into water; and
- the rescuing of persons in danger of drowning.

A contractor must ensure that where a person is exposed to the risk of drowning by falling into the water, the person is provided with and wears a lifejacket.

2.29 Fire precautions on Construction Sites

A contractor must, in addition to compliance with the Environmental Regulations for Workplaces, 1987, ensure that –

- all appropriate measures are taken to avoid the risk of fire;
- sufficient and suitable storage is provided for flammable liquids, solids, and gases;
- smoking is prohibited and notices in this regard are prominently displayed in all places containing readily combustible or flammable materials;
- in confined spaces and other places in which flammable gases, vapours or dust can cause danger-
  - only suitably protected electrical installations and equipment, including portable lights, are used;
  - there are no flames or similar means of ignition;
  - there are conspicuous notices prohibiting smoking;
  - oily rags, waste, and other substances liable to ignite are without delay removed to a safe place; and
  - adequate ventilation is provided;
- combustible materials do not accumulate on the construction site;
- welding, flame cutting, and other hot work are done only after appropriate precautions have been taken to reduce the risk of fire;
- suitable and sufficient fire-extinguishing equipment is placed at strategic locations or as may be recommended by the Fire Chief or local authority concerned, and that such equipment is maintained in a good working order;
- the fire equipment contemplated above is inspected by a competent person, who has been appointed in writing for that purpose, in the manner indicated by the manufacturer thereof;
- a sufficient number of workers are trained in the use of fire-extinguishing equipment;
- where appropriate, suitable visual signs are provided to clearly indicate the escape routes in the case of a fire;
- the means of escape is kept clear at all times;
- there is an effective evacuation plan providing for all -
  - persons to be evacuated speedily without panic;
  - persons to be accounted for; and
  - plant and processes to be shut down; and
- a siren (fire alarm / horn) is installed and sounded in the event of a fire.

2.30 Construction Employees' Facilities

A contractor must, in terms of the Construction Regulations 2014, provide:

- Shower facilities after consultation with the employees or employees' representatives, or at least one shower facility for every 15 persons;
- at least one sanitary facility for each sex and for every 30 workers;
- Toilets to be within walking distance
- Hygiene registers to be completed

- Proof of safe disposal of effulgent waste disposal certificates to be obtained
- changing facilities for each sex;
- and sheltered/shaded eating area.
- Protection from the Elements and raised off the ground.
- Every employer shall provide sanitary facilities at the workplace in accordance with the provisions of Parts F, P and Q of the National Building Regulations.
- Sufficient clean water for all employees. 500ml to each employee every hour.

A contractor must provide reasonable and suitable living accommodation for the workers at construction sites who are far removed from their homes and where adequate transportation between the site and their homes, or other suitable living accommodation, is not available.

2.31 Fall protection

The Contractor must:

- designate a competent person to be responsible for the preparation of a fall protection plan
- ensure that the fall protection plan contemplated above is implemented, amended where and when necessary and maintained as required; and
- take steps to ensure continued adherence to the fall protection plan.

A fall protection plan contemplated above must include-

- a risk assessment of all work carried out from a fall risk position and the procedures and methods used to address all the risks identified per location;
- the processes for the evaluation of the employees' medical fitness necessary to work at a fall risk position and the records thereof;
- a programme for the training of employees working from a fall risk position and the records thereof;
- the procedure addressing the inspection, testing, and maintenance of all fall protection equipment; and
- a rescue plan detailing the necessary procedure, personnel and suitable equipment required to affect a rescue of a person in the event of a fall incident to ensure that the rescue procedure is implemented immediately following the incident.

A contractor must ensure that a construction manager appointed under regulation 8(1) is in possession of the most recently updated version of the fall protection plan.

A contractor must ensure that all unprotected openings in floors, edges, slabs, hatchways, and stairways are adequately guarded, fenced, or barricaded or that similar means are used to safeguard any person from falling through such openings;

Also that no person is required to work in a fall risk position, unless such work is performed safely as contemplated in above and fall prevention and fall arrest equipment are approved as suitable and of sufficient strength for the purpose for which they are being used, having regard to the work being carried out and the load, including any person, they are intended to bear; and securely attached to a structure or plant, and the structure of plant and the means of attachment thereto are suitable and of sufficient strength and stability for the purpose of safely supporting the equipment and person who could fall, and fall arrest equipment is used only where it is not reasonably practicable to use fall prevention equipment.

2.32 Excavation

A contractor must-

- ensure that all excavation work is carried out under the supervision of a competent person who has been appointed in writing for that purpose; and
- evaluate, as far as is reasonably practicable, the stability of the ground before excavation work begins.

A contractor who performs excavation work-

- must take reasonable and sufficient steps in order to prevent, as far as is reasonably practicable, any person from being buried or trapped by a fall or dislodgement of material in an excavation;
- may not require or permit any person to work in an excavation which has not been adequately shored or braced: Provided that shoring and bracing may not be necessary where-
  - the sides of the excavation are sloped to at least the maximum angle of repose measured relative to the horizontal plane; or
  - such an excavation is in stable material: Provided that-
    - permission has been given in writing by the appointed competent person contemplated above upon evaluation by him or her of the site conditions; and
    - where any uncertainty pertaining to the stability of the soil still exists, the decision from a professional engineer or a professional technologist competent in excavations is decisive and such a decision must be noted in writing and signed by both the competent person and the professional engineer or technologist, as the case may be;
- must take steps to ensure that the shoring or bracing contemplated above is designed and constructed in a manner that renders it strong enough to support the sides of the excavation in question;
- must ensure that no load, material, plant or equipment is placed or moved near the edge of any excavation where it may cause its collapse and consequently endangers the safety of any person, unless precautions such as the provision of sufficient and suitable shoring or bracing are taken to prevent the sides from collapsing;
- must ensure that where the stability of an adjoining building, structure or road is likely to be affected by the making of an excavation, steps are taken to ensure the stability of such building, structure or road and the safety of persons;
- must cause convenient and safe means of access to be provided to every excavation in which persons are required to work, and such access may not be further than six metres from the point where any worker within the excavation is working;
- must ascertain, as far as is reasonably practicable, the location and nature of electricity, water, gas or other similar services which may in any way be affected by the work to be performed, and must before the commencement of excavation work that may affect any such service, take the steps that are necessary to render the circumstances safe for all persons involved;
- must ensure that every excavation, including all bracing and shoring, is inspected-
  - daily, prior to the commencement of each shift;
  - after every blasting operation;
  - after an unexpected fall of ground;
  - after damage to supports; and
  - after rain,

  by the competent person, in order to ensure the safety of the excavation and of persons, and those results must be recorded in a register kept on site and made available on request to an inspector, the Client, the Client's Safety Agent, any other contractor or any employee;
- must cause every excavation which is accessible to the public or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered, to be –
  - adequately protected by a barrier or fence of at least one metre in height and as close to the excavation as is practicable; and
  - provided with warning illuminants or any other clearly visible boundary indicators at night or when visibility is poor, or have resort to any other suitable and sufficient precautionary measure where this is not practicable;
- must ensure that all precautionary measures stipulated for confined spaces as determined in the General Safety Regulations, 2003, are complied with by any person entering any excavation;
- must, where the excavation work involves the use of explosives, appoint a competent person in the use of explosives for excavation, and must ensure that a method statement is developed by that person in accordance with the applicable explosive's legislation; and
- must cause warning signs to be positioned next to an excavation within which or where persons are working or carrying out inspections or tests.

2.33 Demolition Work

A contractor must appoint a competent person in writing to supervise and control all demolition work on site.

A contractor must ensure that before any demolition work is carried out, and in order to ascertain the method of demolition to be used, a detailed structural engineering survey of the structure to be demolished is carried out by a competent person and that a method statement on the procedure to be followed in demolishing the structure is developed by that person.

During a demolition, the competent person contemplated in above must check the structural integrity of the structure at intervals determined in the method statement contemplated in above, in order to avoid any premature collapses.

A contractor who performs demolition work must with regard to a structure being demolished, take steps to ensure that-

- no floor, roof or other part of the structure is overloaded with debris or material in a manner which would render it unsafe;
- all reasonably practicable precautions are taken to avoid the danger of the structure collapsing when any part of the framing of a framed or partly framed building is removed, or when reinforced concrete is cut; and
- precautions are taken in the form of adequate shoring or other means that may be necessary to prevent the accidental collapse of any part of the structure or adjoining structure;
- ensure that no person works under overhanging material or a structure which has not been adequately supported, shored, or braced;
- ensure that any support, shoring, or bracing contemplated above, is designed and constructed so that it is strong enough to support the overhanging material;
- where the stability of an adjoining building, structure or road is likely to be affected by demolition work on a structure, take steps to ensure the stability of such structure or road and the safety of persons;
- ascertain as far as is reasonably practicable the location and nature of electricity, water, gas or other similar services which may in any way be affected by the work to be performed, and must before the commencement of demolition work that may affect any such service, take the steps that are necessary to render circumstances safe for all persons involved;
- cause every stairwell used and every floor where work is being performed in a building being demolished, to be adequately illuminated by either natural or artificial means;
- cause convenient and safe means of access to be provided to every part of the demolition site in which persons are required to work; and
- erect a catch platform or net above an entrance or passageway or above a place where persons work or pass under or fence off the danger areas if work is being performed above such entrance, passageway, or place so as to ensure that all persons are kept safe where there is a danger or possibility of persons being struck by falling objects.

A contractor must ensure that no material is dropped to any point, which falls outside the exterior walls of the structure, unless the area is effectively protected.

No person may dispose of waste and debris from a high place by a chute unless the chute-

- is adequately constructed and rigidly fastened;
- if inclined at an angle of more than 45 degrees to the horizontal, is enclosed on its four sides;
- if of the open type, is inclined at an angle of less than 45 degrees to the horizontal;
- where necessary, is fitted with a gate at the bottom end to control the flow of material; and discharges into a container or an enclosed area surrounded by barriers.

A contractor must ensure that every chute used to dispose of rubble is designed in such a manner that rubble does not free-fall and that the chute is strong enough to withstand the force of the debris travelling along the chute.

A contractor must ensure that no equipment is used on floors or working surfaces unless such floors or surfaces are of sufficient strength to support the imposed loads.

Where a risk assessment indicates the presence of asbestos, a contractor must ensure that all asbestos related work is conducted in accordance with the Asbestos Regulations 2001.

Where a risk assessment indicates the presence of lead, a contractor must ensure that all lead related work is conducted in accordance with the Lead Regulations, 2001.

Where the demolition work involves the use of explosives, a method statement must be developed in accordance with the applicable explosives legislation, by an appointed person who is competent in the use of explosives for demolition work and all persons involved in the demolition works must adhere to demolition procedures issued by the appointed person.

A contractor must ensure that all waste and debris are as soon as reasonably practicable removed and disposed of from the site in accordance with the applicable legislation.

2.34 Scaffolding

A contractor must appoint a competent person in writing who must ensure that all scaffolding work operations are carried out under his or her supervision and that all scaffold erectors, team leaders and inspectors are competent to carry out their work as per the SANS 10085 of 2004.

A contractor using access scaffolding must ensure that such scaffolding, when in use, complies with the safety standards incorporated for this purpose into these Regulations under section 44 of the Act and SANS 10085. Scaffold must be;

- Level and balanced upon the correct footing such as base jacks, U-Jacks, and mobile wheels
- Have the correct Ledgers and bracing methods to secure the frames and Standards
- To be fully boarded with the correct edge protection on both the 0.500m and 1 metre height per working platforms.
- Working platforms to be in accordance with the Tables 4 and 5 of the SANS 10085 for weight restrictions
- Have the correct access that is fitted within the scaffold and grants access to the working platforms and must be fitted with a trap door system.
- Secured with fastening methods such Reveal and fixed ties according to table 7 of SANS 10085. Buttresses to be used when required.
- signage must be displayed to indicate if the scaffold is safe or unsafe to use.
- Trestles to be built in accordance to section 10.16.1 of the SANS 10085 and safety requirements to be met by the scaffolding inspector and scaffold supervisors on site.

2.35 Bulk mixing / Concrete mixer

A contractor must ensure that the operation of a bulk mixing is supervised by a competent person who has been appointed in writing and is –

- aware of all the dangers involved in the operation thereof; and
- conversant with the precautionary measures to be taken in the interest of health and safety.

No person supervising or operating a bulk mixing may authorize any other person to operate the plant unless that person is competent to operate a concrete mixer.

A contractor must ensure that the machinery and plant selected is suitable for the mixing task and that all dangerous moving parts of a mixer are placed beyond the reach of persons by means of doors, covers or other similar means.
No person may remove or modify any guard or safety equipment relating to a concrete mixer, unless authorized to do so by the appointed person.

A contractor must ensure that a record is kept of all repairs or maintenance to a concrete mixer and that the record is available on site to an inspector, the Client, the Client's Safety Agent, or any employee.

2.36 Hazardous Chemical Substances (HCS)

In addition to the requirements in the HCS Regulations, the principal contractor must provide proof in the Health and Safety Plan that:

- Material Safety Data Sheets (MSDS's) of the relevant materials / hazardous chemical substances are available prior to use by the contractor. All MSDS's shall be available for inspection by the agent at all times.
- Risk assessments are done at least once every 6 months.
- Exposure monitoring is done according to OESSM and by an Approved Inspection Authority (AIA) and that the medical surveillance programme is based on the outcomes of the exposure monitoring.
- How the relevant HCS's are being/going to be controlled by referring to:
  - Limiting the amount of HCS
  - Limiting the number of employees
  - Limiting the period of exposure
  - Substituting the HCS
  - Using engineering controls
  - Using appropriate written work procedures
- The correct PPE is being used.
- HCS are stored and transported according to SABS 072 and 0228.
- Training with regards to these regulations was given.

The Health and Safety plan should make reference to the disposal of hazardous waste on classified sites and the location thereof (where applicable).

The First Aider must be made aware of the MSDS and trained in how to treat HCS incidents appropriately.

2.37 Noise Induced Hearing Loss

Where noise is identified as a hazard the requirements of the NIHL regulations must be complied with and the following must be included / referred to in the Health and Safety Plan:

- Proof of training with regards to these regulations.
- Risk assessment done within 1 month of commencement of work.
- That monitoring carried out by an AIA and done according to SABS 083.
- Medical surveillance programme established and maintained for the necessary employees.
- Control of noise by referring to:
- Engineering methods considered
- Admin control (number of employees exposed) considered
- Personal protective equipment considered/decided on
- Describe how records are going to be kept for 40 years.

2.38 Personal Protective Equipment (PPE)

The Contractor shall carry out PPE or clothing needs analysis in accordance with his risk assessment, to determine the necessary PPE or clothing to be used during construction. The Contractor shall make provision to keep adequate quantities of appropriate, SABS approved PPE or clothing on site at all times.

The Contractor must ensure that personnel are trained in the correct use of PPE to be used.

The Contractor must ensure that lost, stolen, worn out or damaged PPE is replaced as required and receipt signed for by employees on site.

2.39 Pressure Vessels (Including Gas Bottles)

The Contractor shall comply with Pressure Vessel Regulations, including:

- Providing competency and awareness training to the operators;
- Providing PPE or clothing;
- Providing and maintain appropriate signage in areas where pressure vessels are used, as applicable;
- Inspect equipment regularly and keep records of inspections;
- Providing appropriate fire fighting equipment (Fire Extinguishers).
- Under pressure vessels to have the following in place;
    - Service date
    - Seals on valves with no leaks and not broken
    - flash arrestors
    - Should be stored and chained together
    - Oxygen / Acetylene bottles to have clips
    - Signage to be visible
    - Gauges in working condition and be visible
    - Permits for use
    - Pressure equip Regs 6. (1) The user shall ensure that the pressure equipment is operated and maintained within its design and operating parameters.

2.40 Fire Extinguishers and Fire Fighting Equipment

The Contractor shall provide adequate, regularly serviced fire extinguishers located at strategic points on site. The Contractor shall keep spare serviced portable fire extinguishers. The Contractor shall have adequate persons trained or competent to use the Fire Fighting Equipment.

Safety signage shall be posted up in all areas where fire extinguishers are located.

2.41 Ladders and Ladder work

The Contractor shall ensure that all ladders are numbered and inspected regularly keeping record of inspections. It should be noted that Aluminium ladders are preferred to wooden ladders.

2.42 General Machinery

The Contractor shall comply with the Driven Machinery Regulations, which include inspecting machinery regularly, appointing a competent person to inspect and ensure maintenance, issuing PPE or clothing and training those that use machinery and enforce compliance.

2.43 Portable Electrical Tools

The Contractor shall ensure that use and storage of all explosive actuating fastening devices and portable electrical tools are in compliance with relevant legislation.

The Contractor shall consider that:

- A competent person undertakes routine inspections;
- Only authorised persons use the tools;
- There are safe working procedures applied;
- Awareness training is carried out and compliance is enforced at all times; and
- PPE and clothing is provided and maintained.

2.44 High Voltage Electrical Equipment

The Contractor shall ensure that, where the work is under, on or near high-voltage electrical equipment the Electrical Installation Regulations, together with safety instructions (Regulations of the Owner of the Equipment) are complied with. Such equipment includes:

- Eskom and the Local Authority equipment
- The Contractor's own power supply; and
- Electrical equipment being installed but not yet taken over from a Contractor by The Client.

2.45 Public Health and Safety

The Contractor shall ensure that each person working on or visiting a site, and the surrounding community, shall be made aware of the dangers likely to arise from onsite activities and the precautions to be observed to avoid or minimize those dangers. Appropriate health and safety signage shall be posted at all times.

2.46 Environmental Conditions and Flora and Fauna

The Contractor must be mindful of adverse weather conditions upon the health and safety of the workforce. This includes inclement weather, strong wind, heat stress, extreme cold, etc. The Contractor's risk assessment process must take into account the risks associated with such weather conditions. The same is true when working in an environment where there is a risk to employees' health and safety from presence of poisonous flora, or wildlife (including bees, snakes, etc). The Contractor's risk assessment process must take these risks into account.

2.47 Occupational Health

Exposure of workers to occupational health hazards and risks are quite common in any work environment, especially in construction. Occupational health hazards and risks exposure is a major problem and all Contractors are to ensure that proper health and hygiene measures are put in place to prevent exposure to these hazards and risks.

The occupational hazards and risks may enter the body in three ways:

- Inhalation through breathing e.g. cement dust;
- Ingestion through swallowing maybe through food intake;
- Absorption through the skin (pores) e.g. painting or use of thinners.

The contractor is required to ensure that all his personnel are medically fit prior to being allowed onto the work site.

All Contractors should ensure that Occupational Hygiene surveys are conducted as per the Occupational Health and Safety Act to ensure employees are not exposed to hazards. Risk Assessments should identify areas where surveys are to be conducted.

2.48 Alcohol and drugs (GSR 2)

1. A 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 a site.

2. No employee shall be under the influence of or have in his or her possession or partake of or offer any other person intoxicating liquor or drugs.

3. An employer or a user, as the case may be, shall, in the case where a person is taking medicines, only allow such person to perform duties at the site if the side effects of such medicine do not constitute a threat to the health or safety of the person concerned or other persons at such site.

2.49 Hazardous Biological Agents

A purpose of this code is to guide employers and employees in managing exposure to SARS-CoV-2 in the workplace by providing guidance to employers and employees in –

(a) Conducting or updating a risk assessment in terms of the OHSA and the HBA in respect of SARS-CoV-2 exposure;
(b) Developing a plan to limit infection, transmission and mitigate the risks of serious illness or death on the basis of that risk assessment;
(c) Implementing the plan;
(d) Managing absence from work due to infection, isolation and adverse effects of vaccination;
(e) Seeking to accommodate employees who refuse or fail to vaccinate against SARS-CoV-2.

Risk Assessment and Plan:

Every Employer must –

(a) Undertake a risk assessment to give effect to its obligations under the OHSA and the HRA regulations;
(b) On the basis of the risk assessment develop or amend its existing plan to include-

(i) Any measures to be implemented in respect of vaccination of its employees and, taking into account the intervals between vaccinations, the dates by which the employees must be fully vaccinated; and
(ii) Any other protective measures contemplated in section 6 (1) and (2) of the Code of Practice;

(c) Consult on the risk assessment and plan with –

(i) Any representative trade union as contemplated by section 14(1) of the LRA; and
(ii) Any health and safety committee established in terms of section 198 of the OHSA or in the absence of such committee a health and safety representative designated in terms of section 17(1) of the OHSA or employee representative; and

(d) Make that risk assessment and plan available for inspection by the trade union and committee contemplated in paragraph (c) and an inspector.

Contents of the risk assessment and plan:

(1) The risk assessment and plan must include –

(a) The identification of the employees contemplated in paragraph (i) of that section:

(b) Reporting of symptoms by employees and isolation of employees who are diagnosed with COVID-19 and are symptomatic;
(c) The workplace protective measures required to be taken in terms of the HBA Regulations including personal protective equipment and ventilation;
(d) A procedure to resolve any issue that may arise from the HRA by an employee of the right to refuse to work in the circumstances contemplated in section 15 (1); and
(e) The process by which the obligations under this Code will be complied with.

(2) The risk assessment and plan may include-

(a) Social distancing measures including minimising of number of workers in the workplace through rotation, staggered working hours, shift and remote working arrangements;
(b) PPE measures contemplated in section 11 (refer to ***PERSONAL PROTECTIVE EQUIPMENT (PPE)*** section of this OHS specification);
(c) Personal hygiene measures such as the wearing of facecloth masks, barriers, hand washing, sanitisers and surface disinfectants;
(d) Any special measures to mitigate the risk of infection or serious illness or death in respect of individual employees at increased risk such as reducing the numbers in and the duration of occupancy in meeting rooms.

2.49 General Practices when Working at Heights

- No Homemade structures or ladders will be permitted on the project.
- Trestle tables are not to be fully extended and must be fully boarded, no drums to be used.
- Surroundings to be clear of rubble.
- Fall protection, fall prevention, and fall rescue plans to be in place and communicated to site employees.
- Ladders to be structurally sound and not broken and in accordance to GSR 13A.
- Only competent persons may be allowed to work at heights with a competency (U/S 229998).
- Correct personal protective equipment to be used (safety harness and lanyard) and edge protection / life lines to be used.
- Anchor points to be in place and determined by an engineer. Anchor points must be pull tested prior to use.
- GSR (6) 6. No employer shall require or permit any person to work in an elevated position and no person shall work in an elevated position, unless such work is performed safely from a ladder or scaffolding, or from a position where such person has been made as safe as if they were working from scaffolding.
- Construction regulation 10 of 2014 to be implemented when working at heights and to prevent any person from falling from heights.
- Employees required to perform work at heights or from fall risk position must be medically fit to perform such work, such employee's medicals must specify "Fall Risk" or "Working at heights" in the exposure section of the annexure 3 template.

2.50 Ventilation and Lighting in the Work Place

Every employer shall cause every workplace in his undertaking to be lighted in accordance with the illuminance values specified in the Schedule to the General Safety Regulations:

Provided that where specialised lighting is necessary for the performance of any particular type of work, irrespective of whether that type of work is listed in the Schedule or not, the employer of those employees who perform such work shall ensure that such specialised lighting is available to and is used by such employees.

The Contractor must ensure that:

- the average illuminance at any floor level in a workplace within five meters of a task is not less than one fifth of the average illuminance on that task;
- glare in any workplace is reduced to a level that does not impair vision;
- lighting on rotating machinery in such that the hazard of stroboscopic effects is eliminated; and
- luminaires and lamps are kept clean and, when defective, are replaced or repaired forthwith.

With a view to the emergency evacuation of indoor workplaces without natural lighting or in which persons habitually work at night, every employer shall, in such workplaces, provide emergency sources of lighting which are such that, when activated, an illuminance of not less than 0.3 lux is obtained at floor level to enable employees to evacuate such workplaces: Provided that where it is necessary to stop machinery or shut down plant or processes before evacuating the workplace, or where dangerous materials are present or dangerous processes are carried out, the illuminance shall be not less than 20 lux.

The contractor must ensure that the emergency sources of lighting prescribed above:
- are capable of being activated within 15 seconds of the failure of the lighting prescribed by subregulation (1);
- will last long enough to ensure the safe evacuation of all indoor workplaces;
- are kept in good working order and tested for efficient operation at intervals of not more than three months; and
- where directional luminaires are installed, these are mounted at a height of not less than two meters above floor level and are not aimed between 10° above and 45° below the horizontal line on which they are installed.

The contractor must ensure that all rooms, stairways, passageways, gangways, basements, and other places where danger may exist through lack of natural light, to be lighted such that it will be safe.

The contractor must ensure that every workplace in his undertaking is ventilated either by natural or mechanical means in such a way that –

- the air breathed by employees does not endanger their safety;
- the time-weighted average concentration of carbon dioxide therein, taken over an eight-hour period, does not exceed one half per cent by volume of air;
- the carbon dioxide content thereof does not at any time exceed three per cent by volume of air;
- the prescribed exposure limits for airborne substances therein are not exceeded; and
- the concentration therein of any explosive or flammable gas, vapour or dust does not exceed the lower explosive limit of that gas, vapour, or dust.

2.51 Ergonomics Regulation of 2019

"competent person" in relation to ergonomics, means a person who– *(a)* has in respect of the work or task to be performed the required knowledge, training and experience in ergonomics and, where applicable, qualifications specific to ergonomics: provided that where appropriate qualifications and training are registered in terms of the provisions of the National Qualifications Framework Act, 2008 (Act No. 67 of 2008), those qualifications and that training must be regarded as the required qualifications and training; and *(b)* is familiar with the Act and the applicable regulations made under the Act;

"ergonomic risk" means a characteristic or action in the workplace, workplace conditions, or a combination thereof that may impair overall system performance and human well-being;

"ergonomic risk assessment" means a programme, process, or investigation to identify, analyse, valuate and prioritise any risk from exposure to ergonomic risks associated with the workplace;

"ergonomics" means the scientific discipline concerned with the fundamental understanding of interactions among humans and other elements of a system, and the profession that applies theory,

principles, data and methods to design in order to optimise human well-being and overall system performance;

The ergonomics regulations will apply to any employer or self-employed person who carries out work at the workplace who may expose any person to an ergonomic risk in the work place and any designer, manufacturer, importer or supplier of machinery, plant, or work systems for the work place.

An employer must, before the commencement of any work that may expose employees to ergonomic risks, have an ergonomic risk assessment performed by a competent person.

The ergonomic risk assessment must be done at intervals not exceeding two years and must include the following;

- a complete hazard identification and all persons who may be affected by the ergonomic risk.
- how employees may be affected by the ergonomic risks;
- the analysis and evaluation of the ergonomic risks;
- the prioritisation of ergonomic risks.

An employer must review the relevant ergonomic risk assessment if:

- such assessment is no longer valid;
- control measures are no longer effective;
- technological or scientific advances allow for more effective control methods;
- there has been a change in –
  - the work methods;
  - the type of work carried out; or
  - the type of equipment used to control the exposure; and
  - an incident occurs or medical surveillance reveals an adverse health effect, where ergonomic risks are identified as a contributing factor.

An employer must ensure that an employee is placed under medical surveillance, which is overseen by an occupational medicine practitioner, if–

- the ergonomic risk assessment referred to in regulation 6 indicates the need for the employee to be placed under medical surveillance; or
- an occupational health practitioner recommends that relevant employees must be under Medical surveillance, in which case the employer may call upon an occupational medicine practitioner to ratify the appropriateness of such recommendation.

An employer must ensure that the medical surveillance consists of–

- in the case of a new employee, an initial health examination before the employee commences employment or within 30 days of commencement of such employment;
- a periodic health examination informed by the ergonomic risk assessment, at intervals specified by an occupational medicine practitioner, but not exceeding two years; and
- an exit health examination informed by the ergonomic risk assessment.

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Both the Client and the Contractor have a duty in terms of health and safety legislation to do all that is reasonably practicable to make members of the public and others being affected by the construction processes aware of possible risks and put preventative measures in place to mitigate the risks. The public and/or visitors shall go through a brief health and safety induction detailing hazards and risks they may be exposed to and what measures are in place to control these hazards and risks.

OTHER HEALTH AND SAFETY SPECIFICATION REQUIREMENTS

The contractor must be aware of the following additional requirements:

What	When	Output
Awareness training (Toolbox Talks)	At least weekly and before hazardous work is carried out	Attendance Register
Health and Safety Committee Meetings	Monthly	Minutes signed by the employer (Contractor) covering: a) Health and Safety Representative Checklist b) Safety report from Safety Officer and Safety Agent
Health and Safety Reports	Monthly	Report covering: a) Incidents/Accidents and Investigations b) Non-conformance c) Health and Safety Training d) HIRA Updates e) Internal and External Audits
General Inspections	As per Health and Safety Specification and OHSA	Report on Health and Safety Specification and OHSA compliance: a) Scaffolding b) Lifting Machinery c) Excavation
General Inspections	Monthly	Covering: a) Firefighting Equipment b) Portable Electrical Equipment c) Ladders
Record keeping	Ongoing	Covering: a) General complaints b) Fines c) General incidents d) MSDS e) Surveillance Medicals f) Inspection Register g) Dept of Labour Notices
Permits	Before commencement with certain activities	As stipulated by the Health and Safety Specification and the OHSA / Construction Regulations

Key:

OHSA – Occupational Health and Safety Act, 1993

ANNEXURE A – REQUIREMENTS FOR THE SAFETY PLAN ASSESSMENT (INCLUDING COVID 19 REQUIREMENTS)

The Contractor must note that the information below is pertinent to the compilation of their safety plan response to this site-specific safety specification and it would be preferred if the Safety Plan is written in the order of the assessment documented below.

No	Item	Notes
1	**Project Directory**	Please state details of Project Client, Project Manager/Principal Agent, Safety Agent, Consulting Engineer, etc. (Name, address, contact details).
2	**Contractors Directory**	Please indicate if you will be using Contractors on this project, if yes, include their details, trade, and FEM details.
3	**Other Parties Directory**	Please indicate contact details for any services applicable (electricity, water, etc.) as well as Department of Labour and Emergency Services.
4	**Project Safety Statement**	The Project Safety Statement must be included in the Safety Plan.
5	**Health and Safety standards for the project (OHS Act, construction regulations, basic conditions of employment, etc.)**	Health and Safety standards must be included in the Safety Plan.
6	**Project Particulars**	Scope of works must be included in the Safety Plan. This is critical.
7	**Existing environment – Structures and Surroundings, Services (Electrical, Water, Sewerage, etc.), Traffic Arrangements, Parking, Access to Site, Storage of Plant and Materials**	Please include these items in the plan. The items must be Site Specific, the location of services and services that will be affected must be mentioned.
8	**Management Structure for safety on the Project**	A structured organogram with names of the responsible people must be included.
9	**Appointed Persons, Supervision**	The required appointments must be identified. A list of the appointed persons must be included in the Safety Plan.
10	**Security Procedures**	Please indicate if a security company will be appointed and include the contact information in the Safety Plan.
11	**Registers list and inspection frequency**	A list of the Inspection Registers that will be on file must be included in the Safety Plan.
12	**Design Co-ordination**	Please indicate your procedure for implementation of design changes by designer on the project, and the procedures for liaison and implementation of temporary works design on the project.
13	**Contractor Co-ordination**	Mention must be made of how Contractors will be co-ordinated on site to ensure that they work together and not adversely affected health and safety.

No	Item	Notes
14	**Housekeeping, stacking and storage**	Housekeeping policies and procedures must be included in the Safety Plan.
15	**Waste Disposal Arrangements**	Waste disposal arrangements procedures must be included in the Safety Plan.
16	**Noise and dust control**	Please indicate if any noisy operations (more than 85 decibels) will be carried out and what measures will be used to reduce noise exposure to workforce.
17	**Training Requirements**	Training requirements must be identified and recorded.
18	**Plant and Equipment**	A list of plant and equipment to be used on site must be included in the Safety Plan.
19	**Safety Monitoring Arrangements**	The name, contact details and SACPCMP registration status of the Safety Officer must be included in the Safety Plan. State how often the Safety officer will be on site (note safety specification requirement in section 1.7).
20	**Information for Contractors**	State how information will be given to Contractors on site.
21	**Consultation/communication arrangements with Employees**	State how information will be given to employees e.g. notice board.
22	**Selection of Contractors Procedures**	Principal contractor must state what health and safety procedures they will use to assess the competence and resources of their contractors on site.
23	**Activities with risk to Health and Safety (Risk Assessment)**	A Baseline Risk Assessment must be included in the Safety Plan, it must address the Risks identified in the Safety Specification as well as the risk of any other hazards that the Principal Contractor is aware of that are relevant to the site.
24	**Hazardous Substances**	Must be listed in the Safety Plan and addressed in the Risk Assessment.
25	**First Aid and Medical Procedures**	Please indicate name of first aider, position of first aid box, location of nearest medical facility and emergency numbers.
26	**Fire and Emergency Procedures**	List of emergency telephone numbers must be drawn up and included in the Safety Plan. The position of Fire Extinguishers, Assembly Point location, fire drill frequencies, numbers of fire marshals, etc.
27	**Accident and Incident Reporting and investigation**	State the Accident and Incident Reporting and investigation procedures of your company.
28	**Welfare and Site Facilities**	Elaborate on toilets and eating areas, water provision, COVID-19 ablution provision, how will workers be protected during wet weather conditions etc.
29	**Site Rules**	The Site Rules must be included in the Safety Plan.
30	**Personal Protective Equipment**	The necessity must be identified by Risk Assessments, the required PPE for site risks and COVID-19 control measures.
No	**Item**	**Notes**

32	**Method Statements/Safe System of Works**	A list of Method Statements/Safe System of Works must be included in Safety Plan for all High-risk activities. **PLEASE NOTE THAT THIS IS PARTICULARLY RELEVANT FOR COVID-19. NO WORK MAY COMMENCE UNLESS COVID-19 RISKS AND CONTROL MEASURES HAVE BEEN APPROVED BY THE PROFESSIONAL TEAM. REFER TO SECTION 2.61 OF THIS SAFETY SPECIFICATION.**
33	**Permits and way leaves**	List of activities that Principal Contractor anticipates will require permits and way leaves (including those stated in the safety specification) to be included.
34	**Fall Prevention and Protection Plan and Fall Rescue Plan**	A copy of the Fall Prevention and Protection Plan, fall rescue plan and fall risk assessment must be included in the Safety Plan.
35	**Demolition method statement**	A copy of the Demolition Method Statement must be included in the Safety Plan.
36	**Confined spaces**	The Principal Contractors' procedures for managing access, egress and work in confined spaces must be specified in the Safety Plan. Includes permit procedures, air monitoring, PPE, etc.
37	**Safety Representatives and Safety Committees**	When a project has more than 20 employees a designated employee must be chosen by the labourers to represent them. A safety committee must be established if 2 or more safety representatives are appointed. Please note Safety Specification requirements regarding this section (section 2.12).
38	**Have the significant hazards from the safety specification been addressed?**	See section 1.9 of the Specifications and ensure practical measures have been detailed in the safety plan.
39	**Safety File - Safety Policies in File and Signed by 16(1) CEO.**	Safety Policies must be signed and explained to employees.
40	**Safety File - A copy of the valid Letter of Good standing from FEM / Workman's Compensation must be on file.**	A copy of the valid Letter of Good standing from FEM / Workman's Compensation must be on file.
41	**Safety File - Signed copy of the 37.2 Mandatory Agreement**	A 37.2 Mandatory Agreement needs to be signed between the Client and the Principal Contractor.
42	**Safety File - Appointment letter from Client (as well as 5.1.K)**	The Client must appoint the Principal Contractor in writing.
43	**Safety File – Notification / Permit**	A copy of the Annexure 2 Notification (and proof of submission) to Department of Labour must be available. This can be in the form of a Department stamp, email, or copy of Construction Work Permit.

ANNEXURE B – LEGAL APPOINTMENTS The contractor shall make the following appointments, as required but not limited to:

Chief Executive Officer (OSH Act 16(1)
Contract Director/Manager (OSH Act 16(2)
Construction Manager (CR 8(1)
Construction Supervisor (CR 8(7)
Assistant Construction Supervisor (CR 8(8)
Construction Safety Officer (CR 8(5)
Safety Representative (where > 20 employees on site)
Construction risk assessor (CR 9(1))
Excavation Supervisor (CR13(1)(a)
Demolition Supervisor (CR14(1)
Scaffold Supervisor (CR16(1)
Construction Vehicle and Mobile Plant Operator (CR23(1)(d)(i)
Controller of Temporary Electrical Installations (CR24(c)
Stacking Supervisor (CR28(a)
Fire Extinguishing Equipment Inspector (CR29(h)
Fall Protection Plan Developer (CR 10(1)(a)
Incident Investigator (OSH Act 9(2)
COVID 19 – Compliance Officer and COVID 19 – Manager (to address employees concerns and keep them informed re COVID-19)

ANNEXURE C - BASELINE RISK ASSESSMENTS

Irrespective of the risk presented on site, it will be ensured that sufficient supervision is in place on site, that personnel are trained in accordance with legislation, including the requirement for site specific inductions on site to inform personnel on site of the risks and hazards applicable to the site. Site supervision is responsible for ensuring that the control measures required below are implemented on site.

Probability X Frequency X Consequences = Criticality Rating

P Scale: 2 Unlikely, 4 Remote possibility, 6 Probable, 8 highly probable, 10 Inevitable
F Scale: 2 Yearly, 4 monthly, 6 weekly, 8 once a day, 10 Many times a day
C Scale: 2 Negligible, 4 Marginal, 6 Serious, 8 Critical, 10 Catastrophic

Risk Rating:
H = High – 97 >, M = Medium – 46 > 96, L= Low – 0 > 45.

Risk Assessment Methodology:
Rating the risks

Quantitative risk assessments produce a probability estimate based upon known risk information applied to the circumstances being considered. They can be found in 'safety cases' in high risk industries where, for example, they might indicate the probability of a nuclear incident of serious chemical leak.

Qualitative assessments are subjective, based on the personal judgement of the assessor, backed by more general information about probability. These are much simpler to make, and are those normally referred to by legal requirements.

A descriptive approach simply uses words such as 'insignificant', 'low', 'medium' and 'high' in their normal sense to evaluate the product of the likely severity of the outcome and the probability of its occurrence. Most people have an appreciation of what 'Medium Risk' means for them in their business context and can appreciate that with controls in place the risk should be lowered – preferably to 'Insignificant' or at the least to 'Low'.
In this assessment, we have used a Descriptive Approach.

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
1.	Bricklaying	Caustic contamination with mortar Contact with sharp bladed tools	**P x F x C = 24 = L**	• Use only trained personnel • Safe means of access to be provided • Safe/Suitable working platform required where working at height • PPE for mortar to include gloves where practicable and goggles/ masks where there is a risk of contamination
2.	Brushcutting	Injury from contact with blade/nylon Fire (where petrol used) Electrocution (where electrical tool used)	**P x F x C = 192 = H**	• Person using brushcutter must be trained and competent • Use personal protective equipment (PPE) such as goggles, safety boots, ear protection, gloves, hard hat • Brushcutter must be in good condition and maintained • Adequate supervision on site at all times. • No smoking when refuelling, fire extinguisher to be on hand (where petrol used as fuel source)
3.	Chainsaw Use	Falling tree or branches causing injury to persons Incorrect use of chainsaw causing injury	**P x F x C = 128 = H**	• Person using chainsaw must be trained and competent • Use personal protective equipment (PPE) such as goggles, safety boots, ear protection, gloves, hard hat, chainsaw trousers and jacket • Chainsaw must be in good condition including guards. • Clear area below area of chainsaw use and where tree felling. • When using chainsaw at height practice safety procedures.
4.	Compacting and Filling	Contact with tipping materials Contact with moving plant Vehicles/personnel falling into excavations Contact with underground services	**P x F x C = 192 = H**	• Trained banksman to control vehicles movement • Only trained personnel use plant • Personal Protective Equipment to be worn • Personnel to stand clear as materials are being tipped • Use stop blocks and signs to warn vehicles of excavations, where applicable • Stand clear of plant whilst materials are being compacted • Establish position of underground services and protect services from damage
5.	Compactor Operations	Crushing of feet	**P x F x C = 192 = H**	• Only trained and competent personnel to use the machine • Ensure operative wears steel toe cap shoes or boots at all times
6.	Crusher Operation	Dust Noise Flying particles Contact with machinery/equipment Contact with substance being crushed	**P x F x C = 192 = H**	• Only trained and competent personnel to use the equipment • Appropriate protective equipment must be worn, including eye, ear, respiratory and head protection at all times. Dust suppression measures to be employed. • Crusher must be fitted with guards to prevent unauthorised access. • All access ways must be fitted with adequate guard rails to reduce chance of injury from falls from height. • No person to enter dump hopper to release blockage unless feeder mechanism is stopped and isolated. Another person to be in attendance to ensure tipping does not take place. Control of crusher is duty of crusher attendant and only that person can give dump signal.

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
7.	Contaminated Land (Working in)	Inhalation of toxic vapours Contact with toxic solids	**P x F x C = 192 = H**	• Specific advice to be sought from safety advisor
8.	Cutting Off Disc	Noise Cuts from machine Fire (particularly at refuelling) Flying debris Blade shattering Contamination by fume created or exhaust fume	**P x F x C = 192 = H**	• Use competent personnel. • Hot works control- fire extinguisher, fire watchman. (Permit may be required) • PPE to include gloves, eye protection, hearing protection • Solid working position. • Clear working area • Correct grade of blade must be used. • Good ventilation to be provided (forced if necessary). • Changing of wheels to be by competent persons only • Cut off discs must not be used for grinding (grinding disc thicker) • Bystanders to wear hearing protection, as applicable
9.	Demolition	Falling materials Premature collapse of structure	**P x F x C = 288 = H**	• Ensure there is a current method statement in place • Ensure all emergency procedures are in place and all details are displayed • Ensure that structural demolition has been approved by the designer and site management • Personnel must be competent • Ensure at all times there is a safe means of access and egress • All personnel must wear suitable and sufficient Personal Protective Equipment, including head, eye and skin protection
10.	Diesel	Fire Explosion Skin disease	**P x F x C = 288 = H**	• Suitable fire extinguisher to be in place prior to commencement of works • Ensure competent personnel using materials and competent and trained machinery/equipment operators • Ensure there is a safe place of work at all times • Ensure all personnel wear suitable and sufficient personal protective equipment (PPE) • Health and safety data sheet required
11.	Electrical Commissioning	Electric shock	**P x F x C = 192 = H**	• Personnel to comply with permits to work issued by Client • Personal protective equipment to be worn by employees to prevent electric shock • First aid treatment to be readily available • Only competent and trained persons may decommission or commission electrical equipment
12.	Electric Tools and Electrical Installations	Electric shock Fire	**P x F x C = 192 = H**	• Electric tools and installations to be in good condition • Inspect electric tools before use • Do not use electric tools in wet/damp conditions • Use personal protective equipment such as insulated gloves • Electrical installations register to be maintained, inspected by competent person

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
13.	Excavations (Working in and around)	Toxic fumes Collapse of trench walls/trapping Falling into excavation Collapse of adjacent structures	**P x F x C = 192 = H**	• Deep excavations / monitor air for toxic fumes • Prevent collapse by battering back sides to a safe angle or install temporary support • Protect vehicles from falling into excavations – provide barriers, signage, etc as necessary • Beware of undermining of other structures (eg: buildings, scaffolds) • Record excavation inspections by competent person on daily basis • Provide suitable means of access/egress in case of emergency. • Excavations formed by explosives must be accompanied by method statement approved by Client
14.	Fire	Injuries to workers, pedestrians, residents, road users, damage to property through fire	**P x F x C = 24 = L**	• No littering on site which could become fire hazard, maintain site in clean condition. • No fires to be lit on site. Have a working fire extinguisher at hand at all times. • No smoking or naked flame near flammable substances or in unauthorised areas • Ensure proper storage/use of Petrol/diesel/flammable substances – post warning notices
15.	Flammable Liquids and Gases (Use of)	Fire Explosion	**P x F x C = 192 = H**	• No littering on site which could become fire hazard, maintain site in clean condition. • Have a working fire extinguisher at hand at all times. • No smoking or naked flame near flammable substances or in unauthorised areas • Ensure proper storage/use of Petrol/diesel/flammable substances – post warning notices • Equipment must be in good condition, maintained • Personnel using substances must be trained in safe use and risks
16.	Fragile Materials	Persons or items falling through fragile materials	**P x F x C = 24 = L**	• All fragile materials to be identified and protected prior to work commencing. • Protection to include either covering the fragile materials or excluding activity. • Any coverings to be secured in place • The location of the fragile materials to be indicated by signage
17.	Hand tools	Injuries caused by use of hand tool Impact with the tool Falls due to access problems Contamination with substance being worked	**P x F x C = 24 = L**	Ensure: • Tool is correct for job • Tool is in good order and suitably sharp • Personnel must be competent/instructed in tool usage and tool safely • Lighting is sufficient • Access is safe, working platform is secure, leading edge is guarded • Operative is wearing all necessary PPE
18.	Hazardous Substances	Injuries to workers through use of hazardous substances, eg: injuries to eyes, skin, etc	**P x F x C = 192 = H**	• Use substances in accordance with data sheet, particularly reference protective clothing required (example: gloves, goggles, etc) • Know what First Aid measures are • Have welfare facilities available for washing of hands, etc
19.	Hot Works	Burns to eyes or other parts of the body	**P x F x C = 96 = M**	• Personal Protective Equipment to include eye, skin and hearing protection • Respirator maybe be required where cutting galvanized steel or anywhere else toxic fumes and gases arise. Dust can also be a problem and forced ventilation may be required.

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
20.	Manhole Rings and Pipes Storage	Rolling of rings Collapse of pipes Crushing of persons Stock pile collapse	**P x F x C = 96 = M**	• Manhole rings must be stored flat to prevent them being rolled. • Banks of pipe stock piles are not to be broken until they are ready for use. • Personnel must stand to the side when breaking bands so as not to be hit by falling pipes. • Pipes must be wedged to prevent rolling •
21.	Manual Handling of General Items	Muscular skeletal injuries if the load is too heavy or awkward Operative falling/ tripping Contamination from the substance being carried Fall of material being carried	**P x F x C = 192 = H**	• Personnel should be aware of safe manual handling techniques • Personnel to wear Personal Protective Equipment when carrying items, eg: safety footwear and gloves. • Ensure good housekeeping against tripping/fall hazards. • Operative to get assistance if load too heavy- team lift if necessary. • Utilise mechanical lifting and carrying aids where possible. • Personnel to ensure access equipment, ladders will take weight of operative and load being carried. • Personnel to ensure item being carried is properly bonded or is not be liable to break apart whilst being manually handled. •
22.	Members of Public – Protection of	Injury to member of public and road users from site works	**P x F x C = 192 = H**	• Barriers and signage to be in place • Workers must warn away any members of public from the works • Footpaths and bridges which are open to public must be closed off if in area of works or otherwise made safe so that no injury occurs to members of public • Traffic turning into site – traffic management and signage as required. • Signage to be on road at site entrance warning motorists that construction traffic turning into/out of site access. Keep roads free of mud where possible • Refer to plant risk assessment for details on plant safety precautions • NOTE: SIGNAGE TO BE POSTED ON SITE TO WARN OF CONSTRUCTION TRAFFIC MOVEMENTS. SAFE MEANS OF ACCESS FOR BOTH CONSTRUCTION TRAFFIC TO SITE AND PRIVATE HOMEOWNERS MUST BE AGREED.
23.	Noise and Dust	Breathing in dust can cause long term health problems, noise can damage hearing	**P x F x C = 384 = H**	• Wear respiratory and hearing protection • Dampen down and minimise dust where possible.
24.	Overhead Services (Working near)	Contact with live services causing injury to personnel Damage caused to services	**P x F x C = 96= M**	• Maintain safe clearance levels • Establish presence of any services via proper walk through survey of site and/or means of service drawings • Wear personal protective clothing • Ensure height of plant/vehicles does not compromise or exceed clearance levels for overhead services • Obtain information on clearance levels from service provider •

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
25.	Painting	Contact with paint	**P x F x C = 96 = M**	• Refer to safety data sheet for usage instructions, hazards and precautions required. • When working at height, refer to risk assessment addressing this hazard below.
26.	Paving (Laying)	Impact injuries from tile / mallet Caustic burns Sore knees Cuts from cutter	**P x F x C = 96 = M**	• Impervious gloves to be worn/ barrier cream to be used • Kneelers or similar to be available • Personal protective equipment to be worn – for example if saw used to cut pavers
27.	Plant or Vehicles and Equipment Operation	Workers injured by passing traffic Road users and pedestrians at risk from plant operation Noise	**P x F x C = 640 = H**	• Implement traffic protection measures • Trained and competent operators must be used • Check plant and vehicles on daily basis before use and record inspections. Maintain vehicles in safe condition. • Medical certificates of fitness required for construction plant. • Crossing of road by construction vehicles or machines must be limited to the practical minimum • Plant and vehicles must be fitted with amber rotating beacons and reverse alarms. • Wear appropriate protective clothing/equipment, eg: goggles, gloves, ear defenders, etc as appropriate.
28.	Plastering	Falling materials Fall from height Contact with materials	**P x F x C = 192 = H**	• Ensure standard safety procedures are followed • Ensure there is a safe working area • Ensure safe access and egress • Ensure competent personnel are used
29.	Plumbing	Falling material Falling from height Fire Burns Exposure to lead fumes	**P x F x C = 64 = M**	• Ensure standard safety procedures are followed at all times • Only used trained and competent personnel • Ensure there is a safe working area at all times • Ensure materials are stored neatly • Ensure there is safe access and egress at all times • Ensure all personnel wear suitable and sufficient personal protective equipment • Consider a hot works permit system prior to commencing any hot works • Make sure emergency procedures are in place and ensure all personnel are aware of where to go in case of a fire

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
30.	Road Working – working in or next to road	Injury to workers caused by passing traffic Injury to road users and pedestrians by works	**P x F x C = 640 = H**	• Flagmen to be used where interface with construction plant with passers-by or where hazard posed by delivery vehicles turning into/out of site. • Traffic management plan to be approved by Municipality and, if necessary, traffic department • No construction activities to commence until adequate provision made to accommodate traffic in accordance with the South African Traffic Signs Manual. • Use safety signage to warn traffic and pedestrians of construction works • Where existing walk ways/pavements affected by works, must direct pedestrian traffic away to safe walking area. • Wear reflective waistcoats when working on or near the road or road shoulder as well as any other required personal protective clothing. • Crossing of road by personnel must be limited to the practical minimum • Use of fencing or other barriers as appropriate
31.	Scaffold Erection/ Dismantling	Personnel falling from a height Items of scaffold falling onto personnel Scaffold collapsing onto those below	**P x F x C = 192 = H**	• Ensure • scaffold is designed to take the imposed loads • scaffolding is constructed properly • scaffold is not overloaded • scaffolders are fully trained • scaffolding is regularly checked by competent person and record of inspection retained. Written inspections to be recorded on weekly basis • scaffolders must adhere to the safe systems of work. • all fall arrest equipment to be checked and certified in good working order • that ALL understand the safe system of work
32.	Shuttering Walls, Beams, Columns	Falling from height Falling materials from height Cuts and abrasions from splinters and nails	**P x F x C = 192 = H**	• Ensure all personnel wear the appropriate Personal Protective Equipment • Ensure at all times there is a safe working platform • Use only trained and competent personnel • If electrical tools are being used ensure they have been tested and safe to use • Ensure timber is de-nailed after use • Ensure safety standards are followed at all times • Ensure there is a safe means of access and egress at all times
33.	Site Establishment	Injuries during off loading Damage to Property	**P x F x C = 64 = M**	• competent personnel to be used in offloading personnel • unauthorised personnel to be kept away from area, use barriers and signage as necessary • unloading and establishment to be under control of competent supervision • all equipment and tools used for unloading and site establishment to be in good condition and maintained • safe access and egress to be maintained, traffic management to be considered. • All electrical equipment to be in safe condition • Workers to use safe manual handling techniques when unloading/loading/lifting items

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
34.	Site Strip	Overturning Vehicles	**P x F x C = 64 = M**	• Follow standard safety procedures • Only use trained and competent personnel • Ensure there is a suitable and safe means of access and egress • Ensure banksman used when required • Ensure all personnel wear suitable reflector vests as required
35.	Underground Services	Striking of buried services	**P x F x C = 216 = H**	• Make all necessary enquiries to establish what services are in the area. Consult drawings and advice from service provider (eg: Municipality or ESKOM) when planning work. • Assume all service to be live (Unless confirmation is received to confirm that services are isolated or otherwise made safe). Do not work near live services without authorisation from site management. • Comply with the requirements of the safe system of work for underground services. • Where available, locate services with a locator • Hand dig around services
36.	Working at Height	Personnel falling form height Falling debris Those beneath being injured	**P x F x C = 800 = H**	• All access equipment is properly constructed (inspections record must be maintained) • Only trained personnel construct, dismantle or control the access equipment • All access equipment must have full toe boards and guardrails - comply with SANS 10085 on erection, use and dismantling of scaffolding • No access equipment may be loaded above the level of the guardrail • No access equipment to be loaded above its safe working load • Where work involves leaning out on an open leading edge, then all personnel are to be fitted with full body harness. The harness must be connected at all times • All fall arrest equipment to be correctly maintained • Ensure if ladders are being used for access, they are either footed or tied. Also the ladder must be set at the correct level of 1 in 4 or approximately 75°
37.	Working with Effluent	Contact with effluent causing sickness or disease	**P x F x C = 216 = H**	• ensure good hygiene facilities • personnel to be competent in work activity • personnel to wear appropriate personal protective equipment such as goggles, overall, gloves and goggles

ANNEXURE D- COVID-19 RISK ASSESSMENT

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
38.	Site Preparation	Site might be infected with COVID19 contagion during lock down	**P x F x C = 64 = M**	Inspect the site to assess conditions. Revise any policies, method statements for risks and hazards identified for review. Decontaminate the site, in affected areas, ensure the availability of hand washing facilities and sanitizers, throughout the site, and at entrances. Ensure sanitising and hand washing facilities are available at ablution areas, common eating areas, offices, canteens, security
39.	Occupational Health	Older workers of 60+, workers with underlying auto-immune or chronic diseases are at increased risk of infection (note that workers may be symptom free but infected with Covid-19)	**P x F x C = 800 = H**	All workers are to be screened and have a valid certificate of fitness on return to work. A full questionnaire to be completed daily before entry on site, and those identified as high risk, or exhibiting flu like symptoms, must be separated and refused entry to
40.	Labour	Underlying auto-immune or chronic diseases, socio-economic status, having to use public transport to get to work	**P x F x C = 800 = H**	A full questionnaire to be completed daily before entry on site, and those identified as high risk, or exhibiting flu like symptoms, must be separated and refused entry to site until declared symptom free by a medical practitioner. Daily temperature readings to be taken on entry to site; Induction, toolbox talks to be done daily on topics relating to COVID 19, personal hygiene and PPE. Strict enforcement on use of PPE Public traffic must comply with government guidelines ref wearing of masks and sanitising requirements.
41.	Transportation (Public and on Site)	Maximum allowed capacity exceeded; No facilities for sanitising vehicles and passengers; No additional protective measures available, e.g. face masks; Unlicensed drivers and operators	**P x F x C = 800 = H**	Selection and provision of transport services compliant with gazetted requirements; Policy and procedures and rules for travel, where possible to limit the use of public transport, or to arrange selective methods of transport, ongoing toolbox talks and supply of cloth masks to be worn when travelling or moving on and off site. Vehicle occupancy maintained at 70% capacity or less; Vehicles sanitised between trips; hand sanitiser provided for passengers.
42.	Social Distancing	Many construction tasks require more than 1 worker that will be required to work within the limit of 1,5m Access/Egress to and off site; Welfare facilities, Meeting areas	**P x F x C = 800 = H**	Demarcation and spacing of queuing areas; segregation of queuing areas and public outside site perimeters; Meeting/eating areas large enough to maintain 1.5m distance at maximum occupancy. Only essential workers to spend time on site, Staggered meeting/eating times, use of Zoom, Skype, Microsoft Teams for meetings where necessary. Individual, segregated facilities for safe keeping.

No	HAZARD	RISK	RISK RATING (High / Medium / Low)	MINIMUM CONTROL MEASURES
43.	Waste Management	Spreading of virus and contact with virus causing infection from hand washing, drying hands, cleaning equipment, disposal of contaminated waste and other related aspects	**P x F x C = 800 = H**	Establish and follow protocols for disposal of potentially infected waste (receptacles). Awareness through notices (posters) regarding correct procedures of waste disposal. Competent supervision and adequate awareness training required. Provide adequate supplies of material and consumables, provision of sealable disposal containers/bags through appropriate waste removal company. Provide adequate supply of paper towels. If contractors used ensure appropriate management.
44.	Signage	Unauthorised entry to site and work areas compromising workers health (contamination). Acts and behaviour that compromises worker	**P x F x C = 800 = H**	Installation of posters and signage with the site rules and protocols that need to be maintained at strategic points. Competent supervision and adequate awareness training required. Disciplinary steps to be taken against transgressors.
45.	Welfare Facilities	Spreading of virus and contact with virus causing infection	**P x F x C = 800 = H**	Limiting of personnel on site to minimum number required to maintain control and management. Implement and maintain cleaning and disinfecting programme. Site rules for social distancing to 1.5m. Use technology to avoid proximity between individuals where possible
46.	Use of Personal Protective Equipment	Risk of spread of droplet infection through coughing, sneezing when in close contact with other people	**P x F x C = 800 = H**	No employee/ visitor will be allowed on site without a cloth mask. Adequate training must be provided in the correct use and disposal of these masks. Cloth masks must be washed and ironed. Where possible face shields should be used to protect mouth, nose and eyes. Regular cleaning of face shields required. No sharing of PPE will be permitted. Adequate supervision required. COVID PPE does not replace conventional PPE.

ANNEXURE E – SAFETY SPECIFICATION AND BASELINE RISK ASSESSMENT ISSUE REGISTER

Date of Original Safety Specification Compilation	Compiled By	Issue Date
11 September 2023	Jayesh Bhana	11 September 2023

Revision Summary	Revised By	Revision Date

Acknowledgement:

I, _____representing _____(Contractor), have satisfied myself with the content of this Health and Safety Specification and shall ensure that our employees and contractors on site comply with the requirements of this document, our safety documentation and health and safety legislation.

_____ _____

Signature of Contractor Date

Comments:

_____

_____

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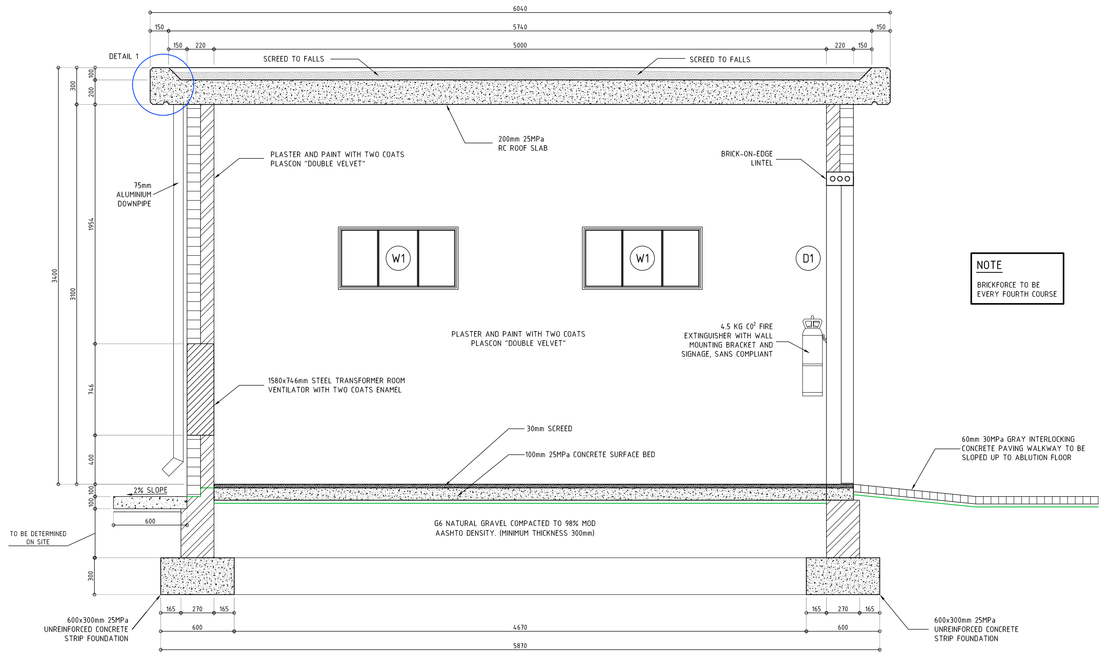
C3.10: DRAWING REGISTER

TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT WORKS

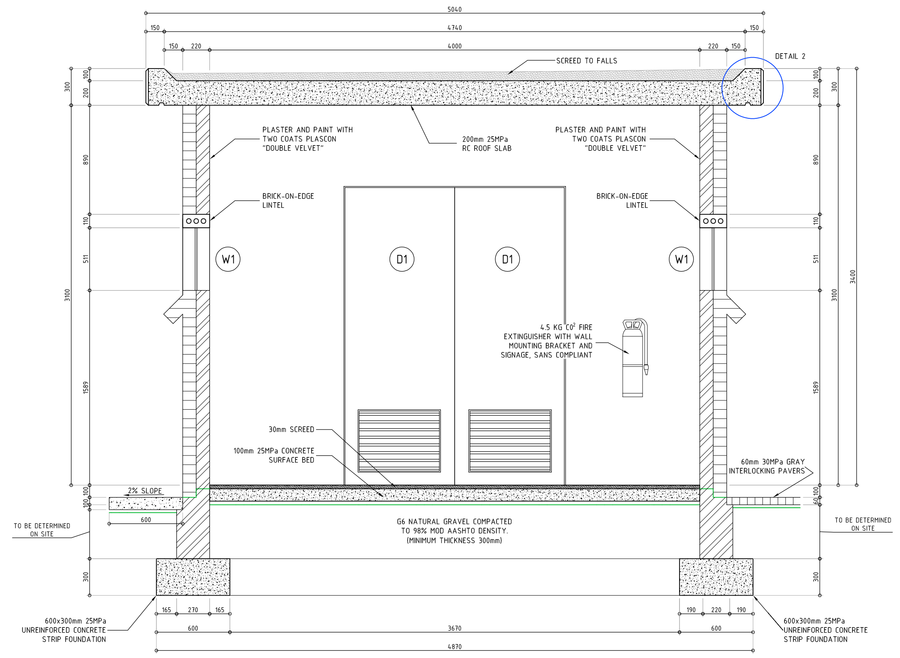
TENDER NUMBER: SCMU5-24/25-0037

The following drawings accompany this document.

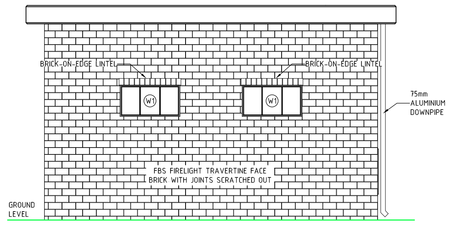
Drawing Description:	Drawing Size:	DWG No:
Civil Drawings		
Stock Fence Layout	A1	E765-001
Site Plan: Hospital WTW & WWTW	A0	E765-002
Sewer Layout (1 of 2)	A0	E765-003.1
Sewer Layout (2 of 2)	A0	E765-003.2
Dam Wall and overflow protection	A0	E765-004
Water Treatment works Layout	A3	E765-005
Fencing – Stock Fence	A3	E765-101
3D Dam spillway	A3	E765-102
Blower Room	A0	E765-103
Ablution	A1	E765-104
Sewage Treatment Works: Reactor Mechanical Installations	A0	E765-105
General Details	A1	E765-106
Chlorine Contact Channel	A1	E765-107
Chlorine Building	A1	E765-108
Sewage Treatment Works: Process Flow Diagram	A3	E765-109
Water Treatment Plant Schematic	A3	E765-R01
Pump Station and Pipeline Installations	A0	E765-110
Pump Station Building	A1	E765-111
Electrical Drawings		
Control Telemetry and Scada Block Diagram	A3	1807E-001
Electrical Schematic Diagram	A3	1807E-002
Fire Drawings		
Fire Equipment Floor Plan	A0	1807M-FE-01
Fire Detection Site Plan	A0	1807-FD01
Casualty, X-ray General & Maternity Wards Floor Plan	A0	1807-FD02
Staff housing, Dining kitchen, Stores, Laundry & Clinic/PHC Floor Plan	A0	1807-FD03
Isolation & TB Wards Floor Plan	A0	1807-FD04
Evacuation System Casualty, X-Ray General & Maternity Wards Floor Plan	A0	1807-FD05
Evacuation System Staff Housing, Dining Kitchen, Stores, Laundry & Clinic/PHC Floor Plan	A0	1807-FD06
Evacuation System Isolation & TB Wards Floor Plan	A0	1807-FD07



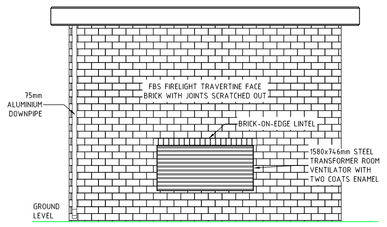
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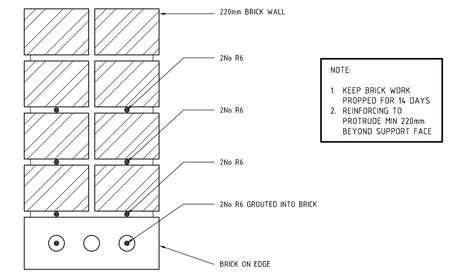
SECTION B-B
SCALE 1:25



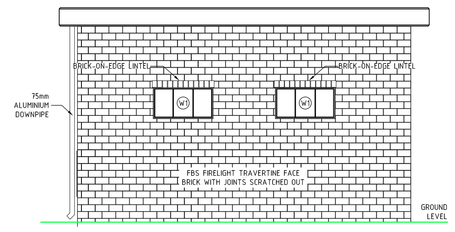
LEFT ELEVATION
SCALE 1:50



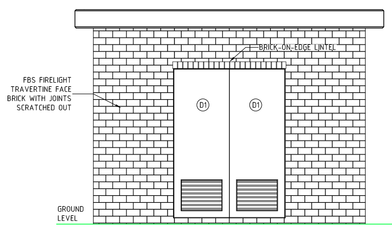
REAR ELEVATION
SCALE 1:50



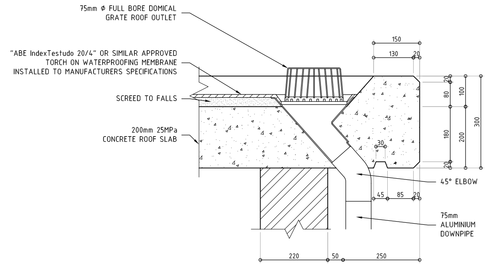
BRICK LINTEL DETAIL
SCALE 1:5



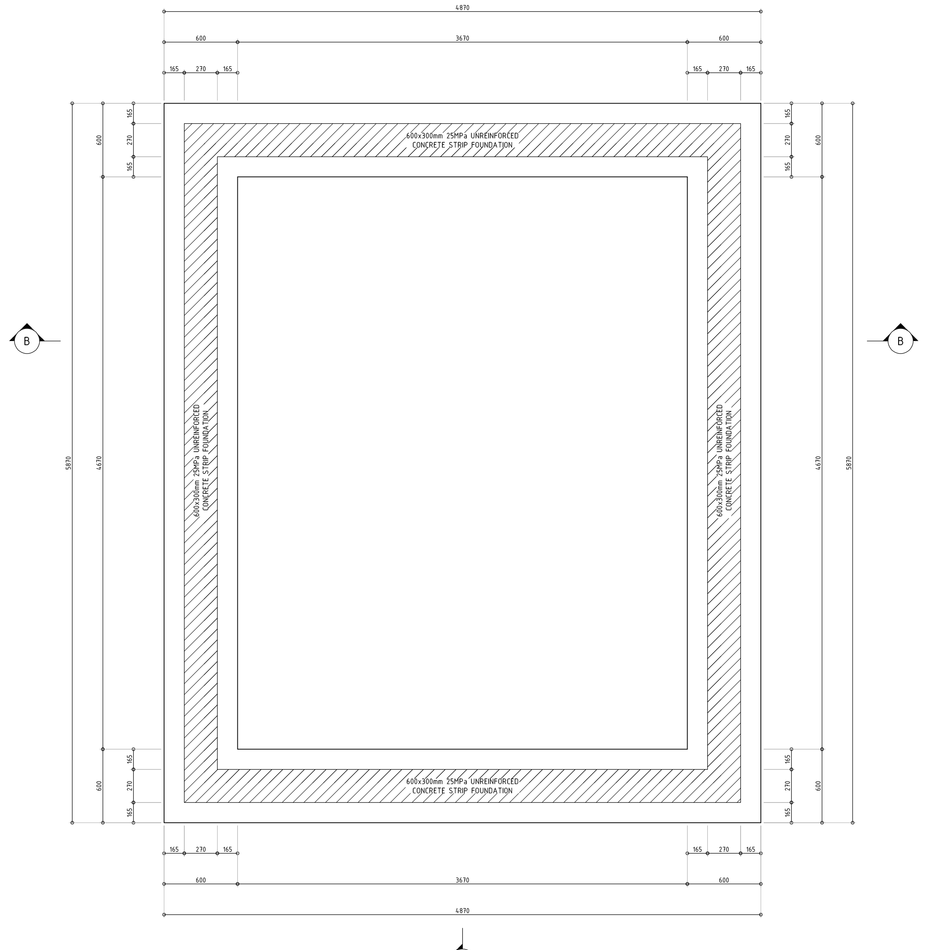
RIGHT ELEVATION
SCALE 1:50



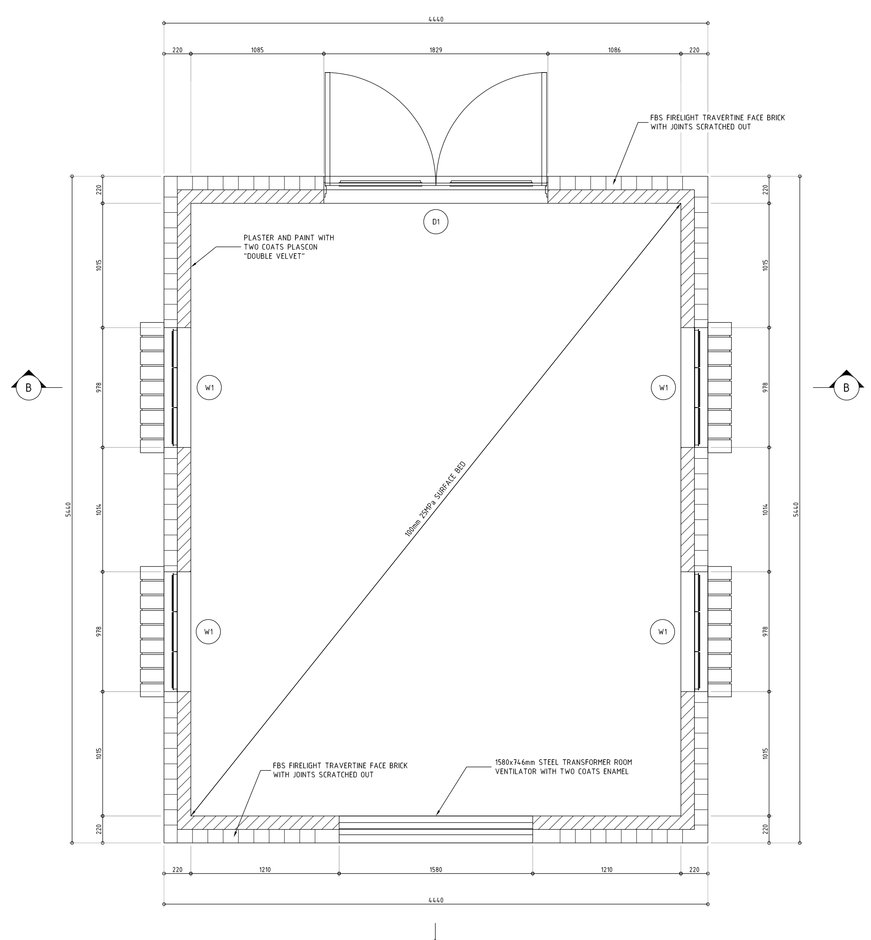
FRONT ELEVATION
SCALE 1:50



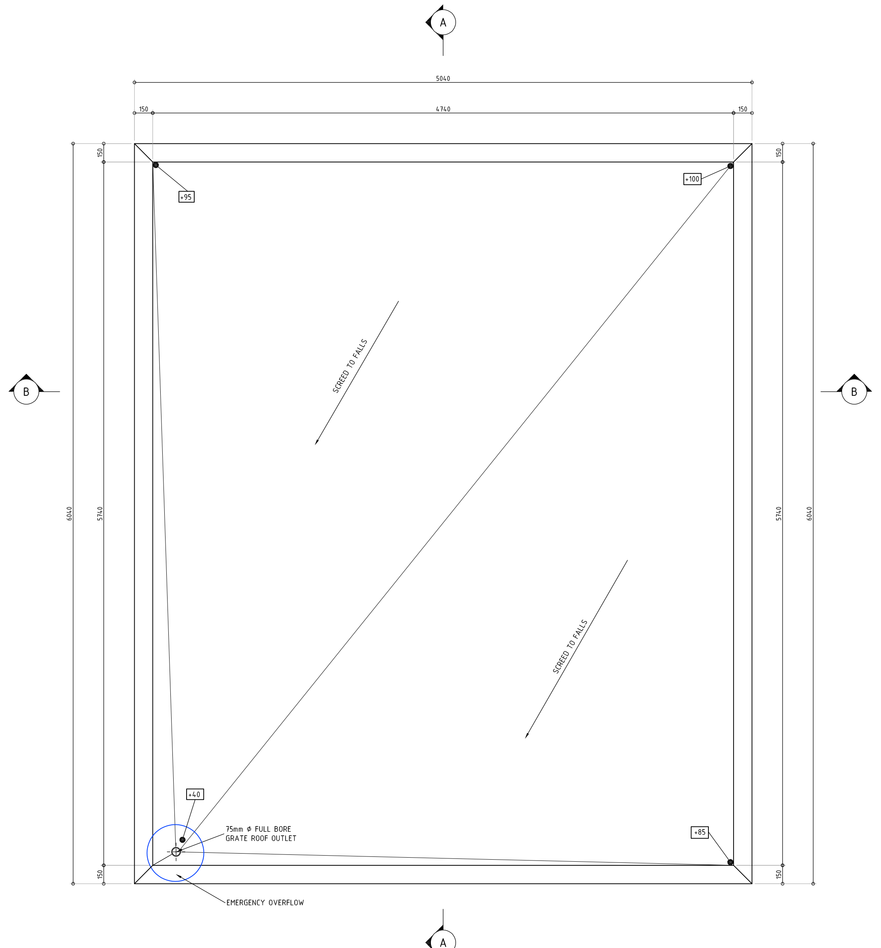
DETAIL 1
(RAINWATER OUTLET)
SCALE 1:10



FOUNDATION LAYOUT
SCALE 1:25

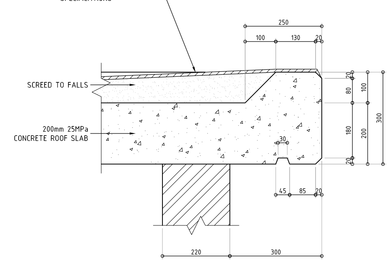


SURFACE BED LAYOUT
SCALE 1:25



ROOF SLAB LAYOUT
SCALE 1:25

LEGEND:
+100 THICKNESS OF SCREED TO FALLS ON ROOFS



DETAIL 2
SCALE 1:10

Window Schedule	W1
Description:	938 x 511 SSF 31
Finishes:	Steel frame to be painted with two coats enamel.
Glazing:	3mm Safety glazing
Amount:	4

Door Schedule	D1
Description:	1829 x 2438 double steel frame and transformer room door with ventilators.
Finishes:	Door and frame to be painted with two coats gloss enamel.
Glazing:	None
Amount:	1

B-324

NR.	DATE	REVISIONS	DRAWN	MK
0	2021/05/06	FOR INFORMATION	DATE	JUNE 2016
			CHECKED	JPCvW
			SCALE	JUNE 2016

ARCHITECT

CLIENT
health
Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

DRAWING
BLOWER ROOM

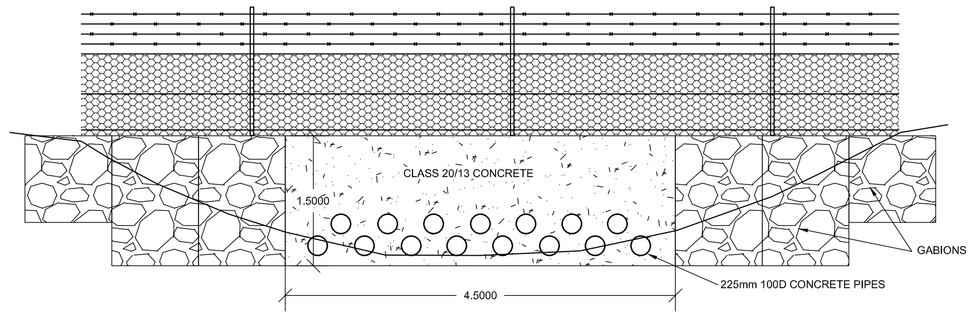
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E : bfn@cse-consult.co.za
CIVIL STRUCTURAL ENGINEERS

PROJECT NO
E765

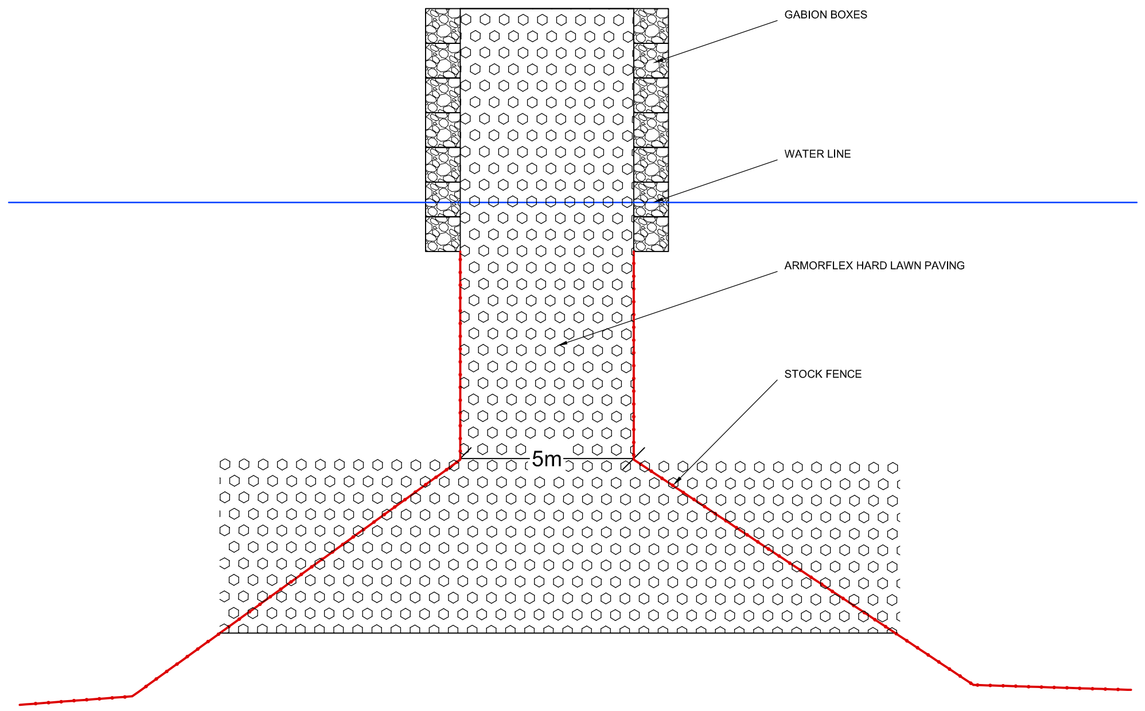
DWG NO.
103

REV
0

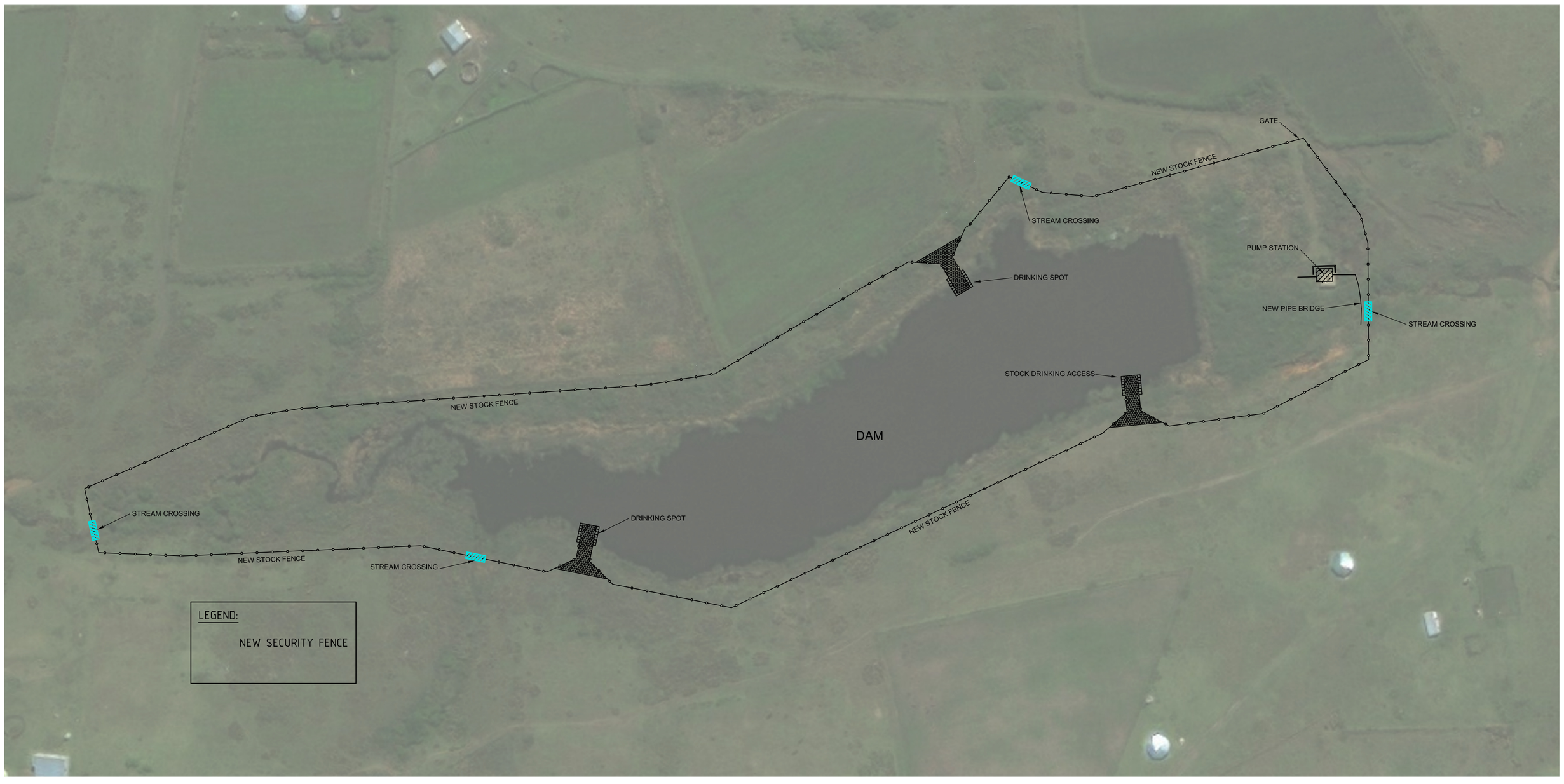
N:\PROJECTS\E765 - Tafalofefe Civils Completion\Drawings 2023_Tender\E765-103_Blower Room 2023-09-07 Na Buitjies | WS3 | 2023/09/07 15:16



TYPICAL SECTION THROUGH STREAM CROSSING



TYPICAL DRINKING SPOT LAYOUT



B-325

N:\PROJECTS\E765 - Tafalofefe Civils Completion\Drawings 2023_Tender\E765-001 Stock Fence Layout 2023-09-07.dwg | WS3 | 2023/09/07 09:16

NR.	DATE	REVISIONS
0	2020/11/05	FOR TENDER
1	2023/09/07	DOCUMENTATION

DRAWN: PK
DATE: 2020/11/05
CHECKED: JPCvW
SCALE: NOT TO SCALE

CLIENT: health
Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT: *TAFALOFEFE HOSPITAL: COMPLETION PROJECT SCMU5-24/25-0037*

DRAWING: *STOCK-FENCE LAYOUT*

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: kokstad@cse-consult.co.za
CIVIL STRUCTURAL ENGINEERS

PROJECT NO: *E765*
Drawing Size: A1
DWG NO.: *001*
REV: *1*


1600 uPVC / 12
1100 uPVC / 12
1000 uPVC / 12
1000 uPVC / 13
1000 uPVC / 14
1000 uPVC / 15
1000 uPVC / 16
1000 uPVC / 17
1000 uPVC / 18
1000 uPVC / 19
1000 uPVC / 20
1000 uPVC / 21
1000 uPVC /

NR.	DATE	REVISIONS
0	2021/05/06	FOR INFORMATION

DRAWN: MK
DATE: JUNE 2016
CHECKED: JPCvW
SCALE: JUNE 2016

ARCHITECT

CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

DRAWING
SEWER LAYOUT PLAN SHEET 1 OF 2

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PROJECT NO: *E765*
DWG NO.: *003.1*
REV: *0*

B-327

N:\PROJECTS\E765-Tafalofefe Civils Compilation\Drawings 2020_Tender\E765-003.1 Sewer Layout Plan 1 of 2 2021-05-07 As Built.dwg | WS1 | 2021/05/07 09:45

NR.	DATE	REVISIONS
0	2021/05/06	FOR INFORMATION

DRAWN: MK
DATE: JUNE 2016
CHECKED: JPCvW
SCALE: JUNE 2016

ARCHITECT

CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

DRAWING
SEWER LAYOUT PLAN SHEET 2 OF 2

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CIVIL STRUCTURAL ENGINEERS

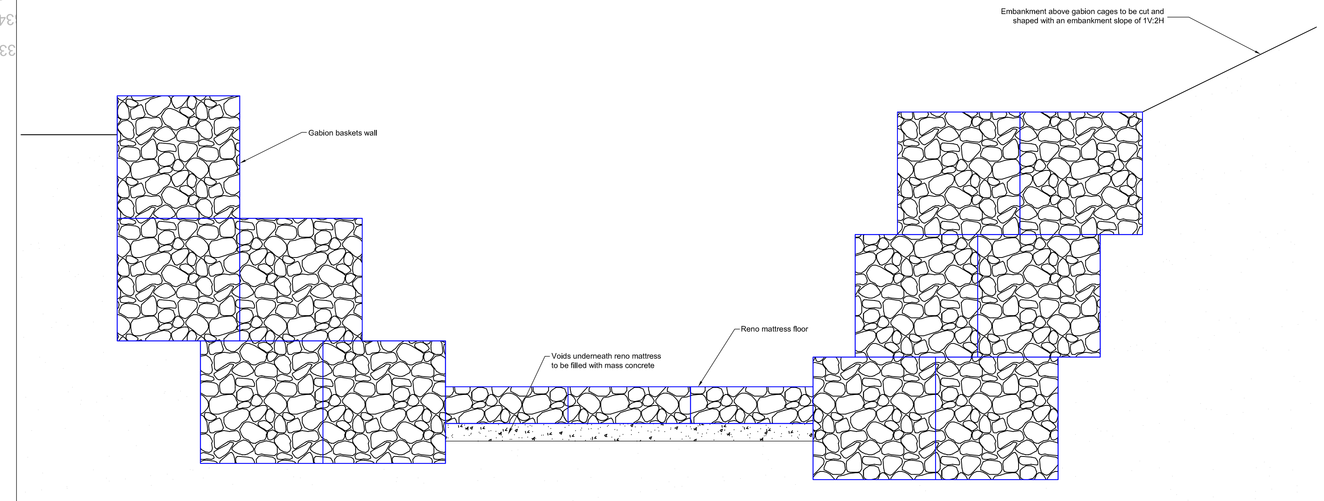
PROJECT NO: *E765*
DWG NO.: *003.2*
REV: *0*

B-328



DAM OVERFLOW + DAM WALL RIP RAP PROTECTION
SCALE 1:250

SECTION B-B
TYPICAL SECTION THROUGH DAM
WALL WITH RIP RAP PROTECTION
SCALE 1:50



SECTION A-A
TYPICAL SECTION THROUGH
DAM OVERFLOW
SCALE 1:25

NOTES

NR.	DATE	REVISIONS
0	2021/05/07	FOR TENDER
1	2023/07/09	DOCUMENTATION

DRAWN	CHECKED
PK	JPCvW
DATE	SCALE
NOVEMBER 2020	AS SHOWN

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CIVIL STRUCTURAL ENGINEERS

ARCHITECT

CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT
SCMU5-24/25-0037

DRAWING
DAM OVERFLOW + RIP RAP PROTECTION LAYOUT

PROJECT NO		
E765	*Drawing Size: A0*	
DWG NO.	REV	
004	*1*	

B-309

N:\PROJECTS\E765 - Tafalofefe Cvils Complete\Drawings 2023_Tender\E765-004 - Dam Wall and Overflow Protection 2023-09-07.dwg | WS3 | 2023/09/07 09:04

LEGEND:

- DOMESTIC WATER
- FIRE WATER
- Ø160 PVC CLASS 34 - SLUDGE WASTE FROM WTW
- VALVE
- PUMP
- FLOW DIRECTION
- SITE FIRE HYDRANT (FH)

EXISTING 140m3 UNDERGROUND RESERVOIR

EXISTING 58m3 ELEVATED WATER TANK

EXISTING HOSPITAL DOMESTIC SUPPLY

SUBMERSIBLE RE-CIRCULATION PUMP: PUMP NO. 1 (DUTY/STANDBY)

40Ø HDPe / 6

Ø50 HDPe / 6 TO WWTW

Ø40 HDPe / 6

Ø50 HDPe / 6

EXISITNG 50m3 GROUND RAW WATER TANK

EXISTING Ø110 uPVC / 6

Ø100 uPVC/6

+ 49400 Y

+ 49300 Y

+ 3589700 X

WATER PLANT

LAUNDRY

ISOLATION

BOILER

HOUSE

HOUSE

HOUSE

HOUSE

Ø90 uPVC / 6

NEW MAIN SUPPLY CABLE FROM SUBSTATION

WTP

NEW EQUIPMENT BUILDING

SCMU5-24/25-0037

DOMESTIC BOOSTER PUMP: PUMP NO. 2

FIRE BOOSTER PUMP: PUMP NO.3

NEW 260m3 POTABLE + FIRE WATER TANK (GROUND LEVEL)

110Ø uPVC / 12

160Ø uPVC / 12

160Ø uPVC / 12

Ø50 HDPe / 6

NOTES

NR.	DATE	REVISIONS
0	2020/11/29	FOR TENDER
1	2023/09/07	DOCUMENTATION

DRAWN: PK	CHECKED: JPCvW
DATE: NOVEMBER 2020	SCALE: N.T.S.

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ARCHITECT

CLIENT

health
Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL:WATER AND WASTEWATER TREATMENT

DRAWING
WATER TREATMENT WORKS LAYOUT

PROJECT NO	Drawing Size: A3
E765	
DWG NO. 005	REV 1

B-330

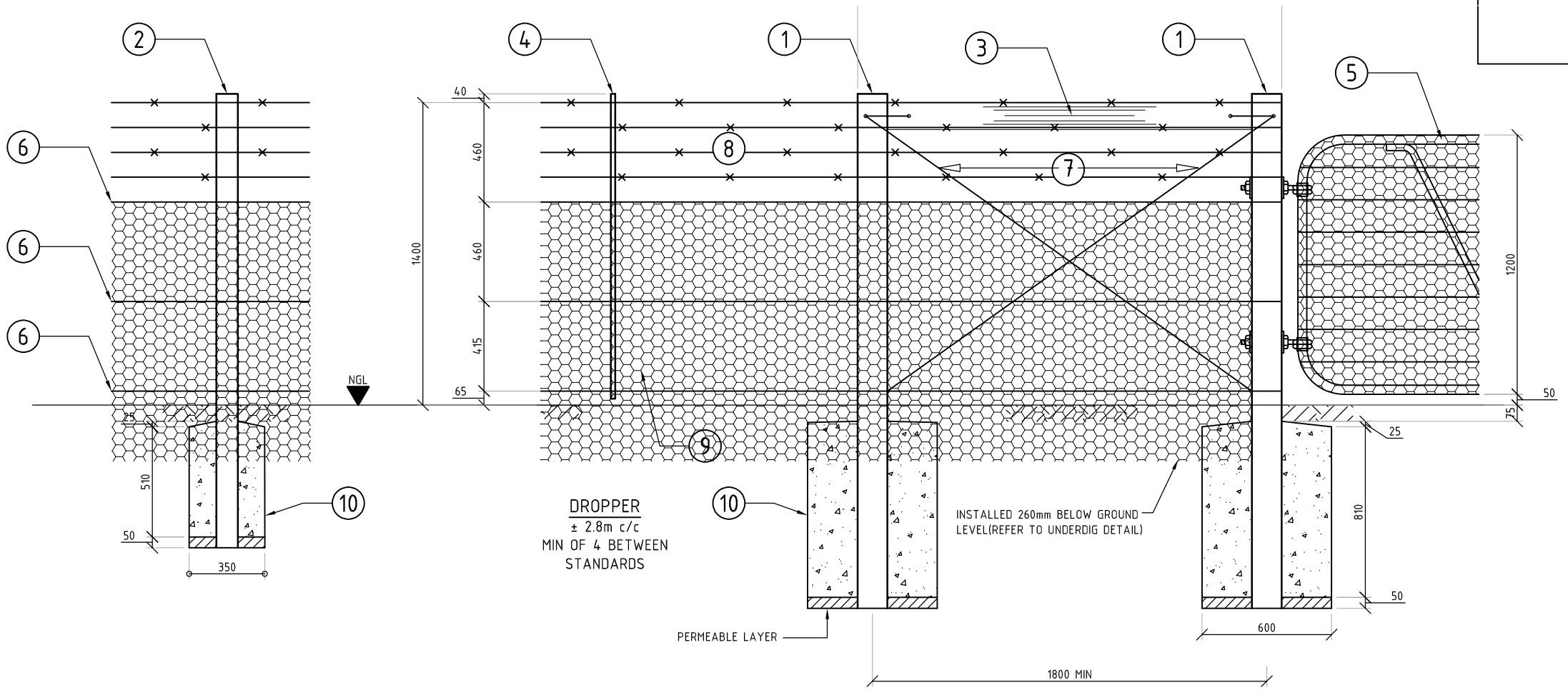
N:\PROJECTS\E765 - Tafalofefe Civils Completion\Drawings 2023_Tender\E765-005 Water Treatment Works Layout Plan 2023-09-07.dwg | WS3 | 2023/09/07 12:05

LEGEND

1. 125 -150 TOP Ø TREATED TIMBER POLE 2400mm LONG
2. 100-125 TOP Ø TREATED TIMBER POLE 2100mm LONG
3. 100-125 TOP Ø TREATED TIMBER POLE APPROX 1725mm LONG
4. 32-40mm TOP Ø TREATED TIMBER POLE 1400mm LONG
5. GALVANIZED 3.0 X 1.2m FARM GATE OF 43 X 2.64mm DIA TUBING, COMPLETE WITH HINGES AND WIRE
6. TOP, INTERMEDIATE & BOTTOM WIRES : SMOOTH STRAINING WIRES
7. 4 CORD STRAINING WIRE
8. GALV BARBED WIRES: HIGH TENSILE STEEL SINGLE STAND 2.80mm X 1.90mm OVAL SHAPED ZINC COATED WIRE
9. 75mm HEXAGONAL WIRE NETTING 1.8mm DIA GALV MILD STEEL 1200 WIDE
10. CLASS 20/19 CONCRETE

NGL NATURAL GROUND LEVEL

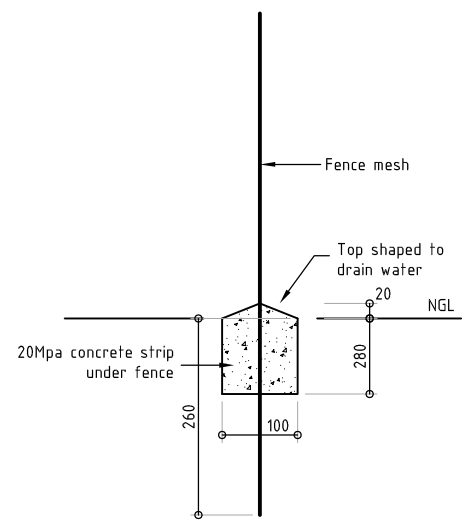
NOTES:
1. NOTCHES REQUIRED FOR CORNER POSTS, STRAINING POSTS & STANDARDS.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH SECTION 5500 OF COLTO STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE WORK.



STANDARD
(14,0m c/c)

STRAINING POST CORNER/GATE POST

MAX SPACING OF 280m IN SOFT GROUND
MAX SPACING OF 420m IN HARD GROUND



UNDERDIG UNDER FENCE
SCALE 1:10

B-331

N:\PROJECTS\E765 - Tafalofefe Civils Completion\Drawings 2023_Tender\E765-101 Fending_Stock Fence 2023-09-07.dwg | WS3 | 2023/09/07 09:31

NR.	DATE	REVISIONS
0	2021/05/07	FOR TENDER
1	2023/09/07	DOCUMENTATION

DRAWN PK
DATE 2020/11/04
CHECKED JPCvW
SCALE AS SHOWN

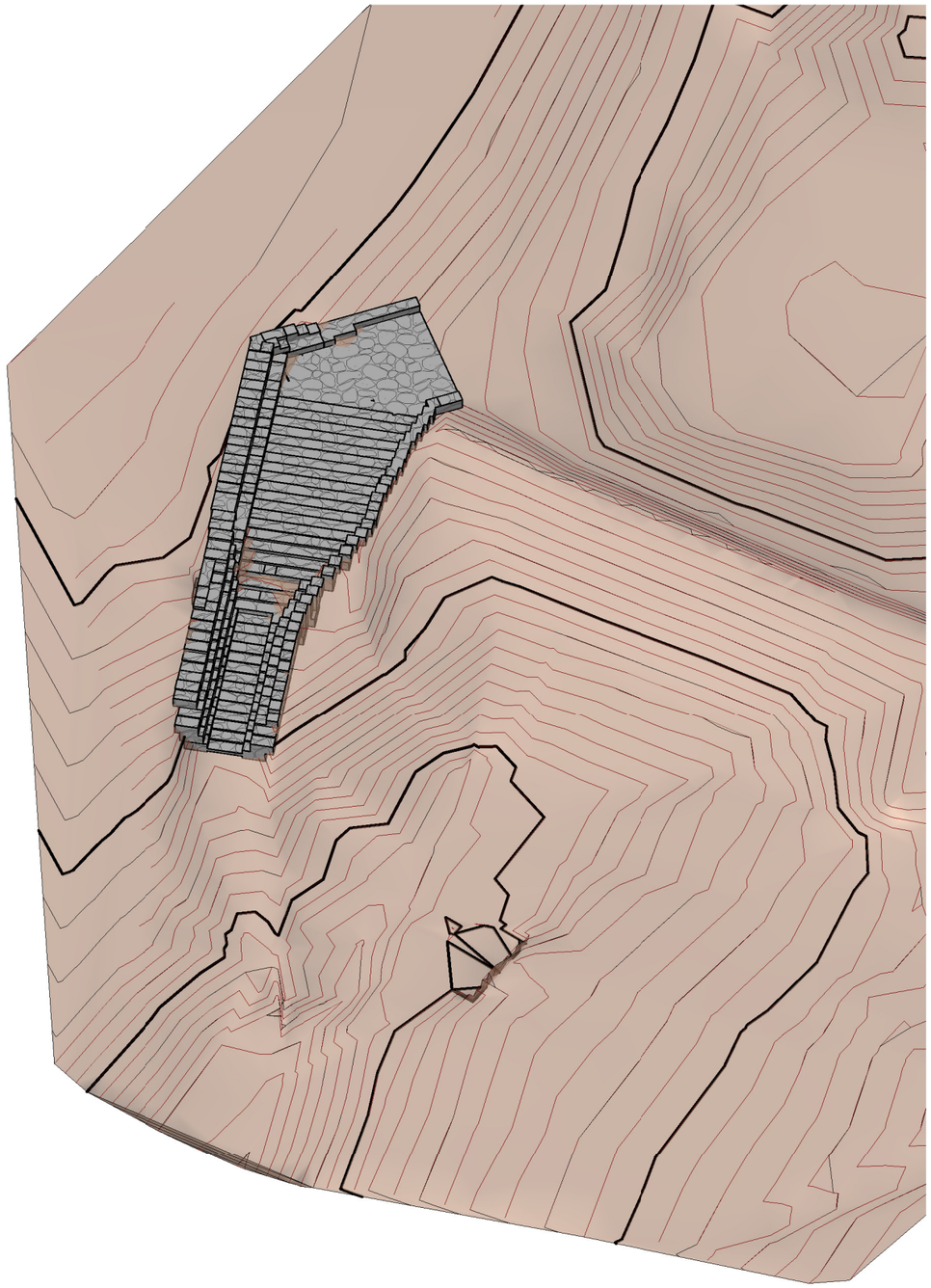
CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE
HOSPITAL:WATER AND
WASTEWATER TREATMENT

DRAWING
FENCING- STOCK FENCE

CSE CIVIL STRUCTURAL ENGINEERS

PROJECT NO E765
Drawing Size: A3
DWG NO. 101
REV 1





1 Dam Spillway

NR.	DATE	REVISIONS
0	2021/05/07	FOR TENDER
1	2023/09/07	DOCUMENTATION

DRAWN MD
DATE 04/04/19
CHECKED JPCvW
SCALE AS INDICATED

ARCHITECT

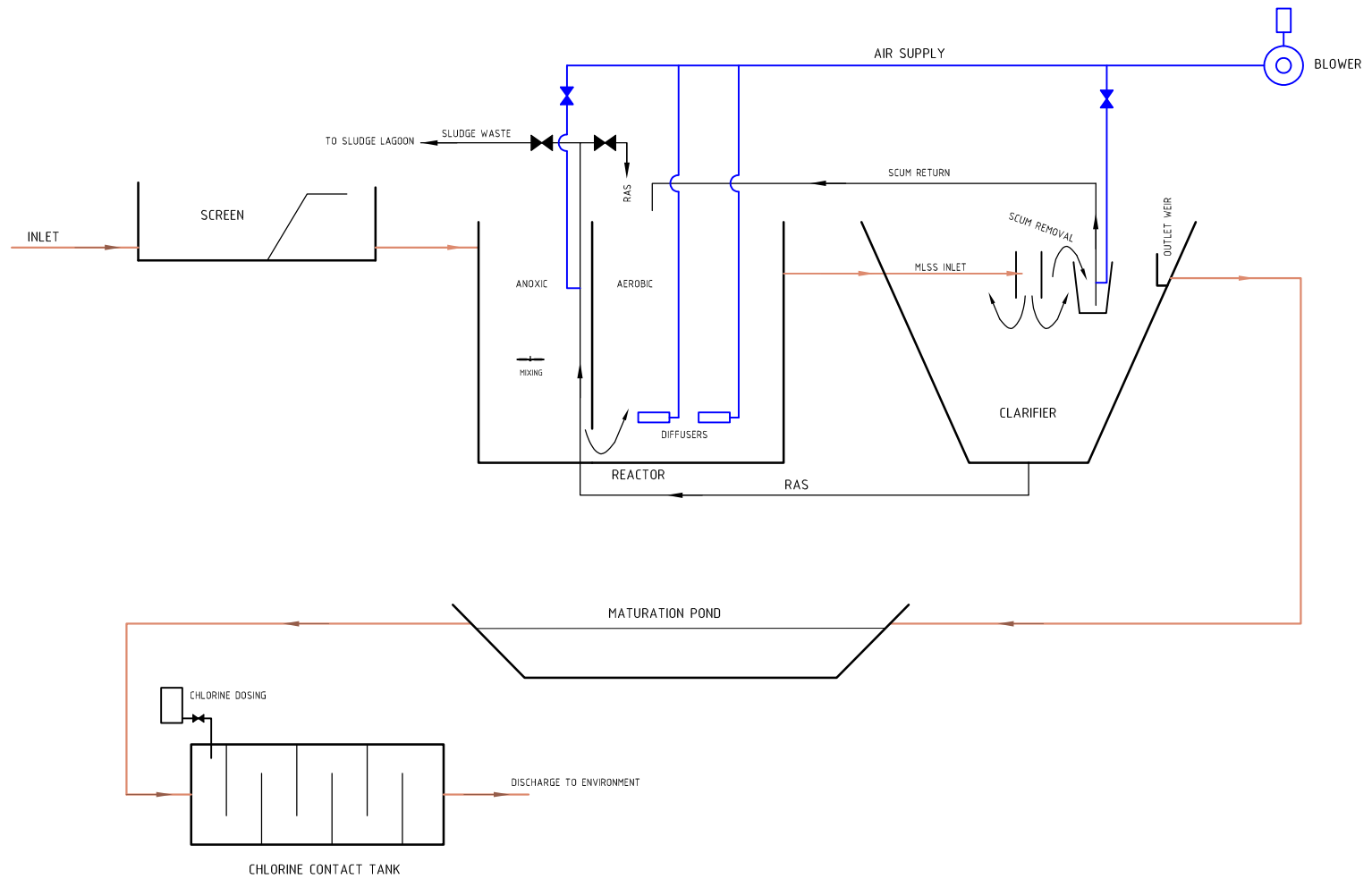
CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

DRAWING
3D DAM SPILLWAY

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CIVIL STRUCTURAL ENGINEERS

PROJECT NO *E765*
Drawing Size: A3
DWG NO *102*
REV *1*



PFD FOR EXTENDED AERATION RETURN ACTIVATED SLUDGE WWTW

LEGEND

- AIR LIFT FLOW
- GRAVITY FLOW
- PRESSURIZED AIR SUPPLY

NOTES

NR.	DATE	REVISIONS
0	2021/05/05	FOR TENDER
1	2023/09/07	DOCUMENTATION

B-333

DRAWN JPCvW	CHECKED WS
DATE APRIL 2017	SCALE N.T.S.

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ARCHITECT

CLIENT

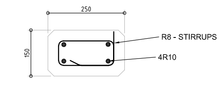
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

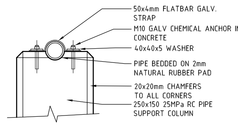
DRAWING
SEWAGE TREATMENT WORKS:PROCESS FLOW DIAGRAM

PROJECT NO E765	Drawing Size: A3
DWG NO. 109	REV 1

N:\PROJECTS\E765 - Tafalofefe Civils Completion\Drawings 2023_Tender\E765-109 Sewage Treatment Works_Process Flow Diagram 2023-09-07.dwg | WS3 | 2023/09/07 09:39



150X250mm RC SUPPORT BLOCK
SECTION
NTS



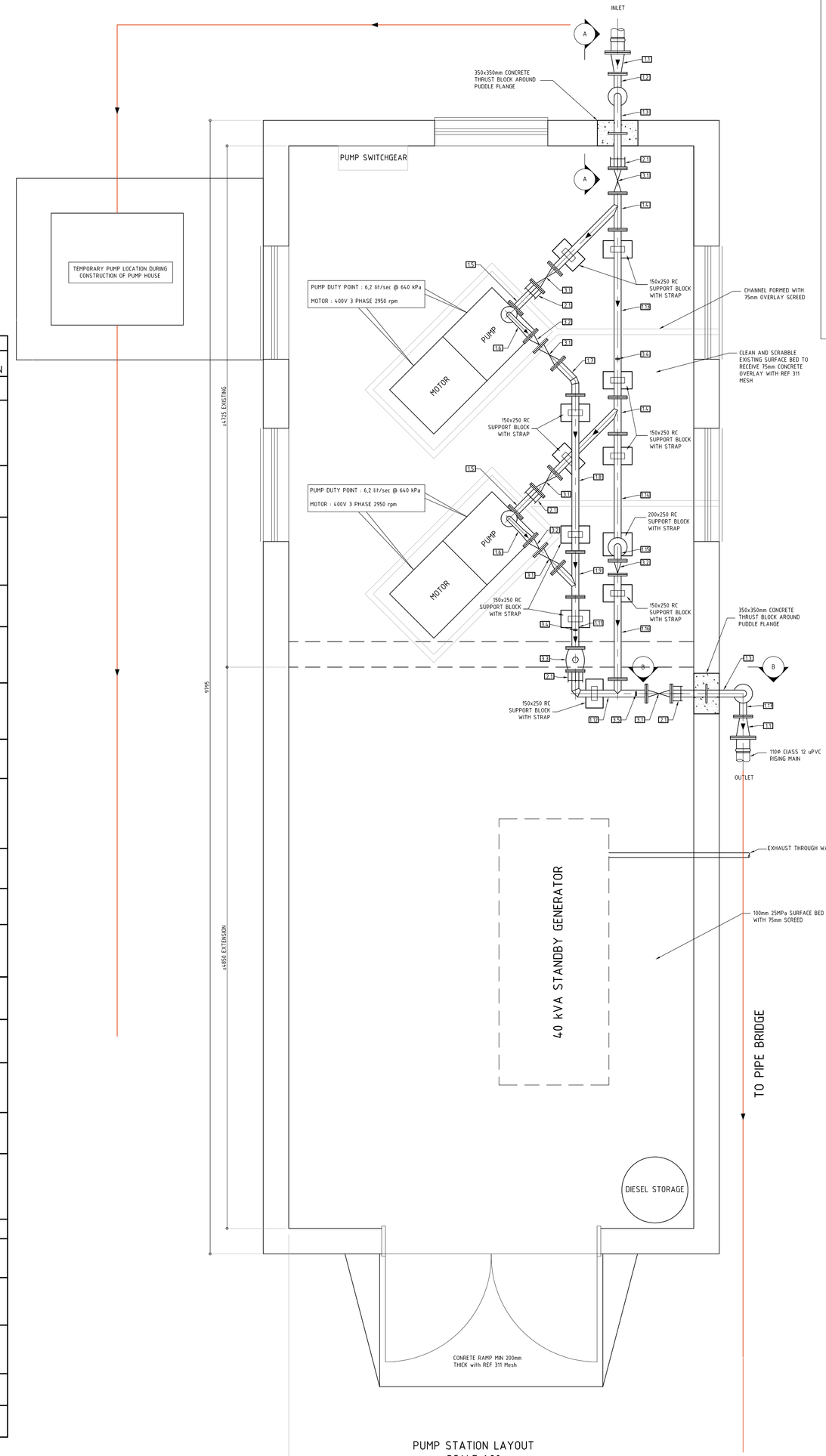
150x250mm RC SUPPORT
BLOCK WITH TIE DOWN
STRAP DETAIL
1:10

PUMP STATION: PIPE SCHEDULE

ITEM NO.	QTY.	DESCRIPTION	SCHEMATIC LAYOUT	FLANGE SPECIFICATION
1.1	2	50x100 Ø REDUCER BOTH ENDS FLANGED	50mm Ø 100mm Ø	SANS 1123 - TABLE 1600/3
1.2	1	50 Ø PIPE BOTH ENDS ARE FLANGED AND THREE SEGMENT 90° BEND	50mm Ø, 50mm Ø, R 3x confirmed (min 250mm), 200	SANS 1123 - TABLE 1600/3
1.3	2	50 Ø PIPE THREE SEGMENT 90° BEND ONE END FLANGED, OTHER END SUITABLE FOR "KLAMFLEX" FLANGE ADAPTOR WITH PUDDLE FLANGE	200, 100, 100, 50mm Ø, 50mm Ø	SANS 1123 - TABLE 1600/3
1.4	3	50 Ø 45° BRANCH ALL ENDS FLANGED	50mm Ø, 50mm Ø, 50mm Ø, 45°, 125, 125	SANS 1123 - TABLE 1600/3
1.5	3	50 Ø PIPE ONE END FLANGED, OTHER END SUITABLE FOR "KLAMFLEX" FLANGE ADAPTOR	50mm Ø, 244	SANS 1123 - TABLE 1600/3
1.6	3	32 Ø PIPE BOTH ENDS FLANGED AND ONE END WITH 32x50 REDUCER AND RADIUS 90° BEND	244, 50mm Ø, 32mm Ø, 32, 50	SANS 1123 - TABLE 1600/3
1.7	1	50 Ø PIPE 45° BEND BOTH ENDS FLANGED	50mm Ø, 50mm Ø, 45°, 125, 125	SANS 1123 - TABLE 1600/3
1.8	1	50 Ø PIPE BOTH ENDS FLANGED	50mm Ø, 1235	SANS 1123 - TABLE 1600/3
1.9	1	50 Ø PIPE BOTH ENDS FLANGED;WITH NIPPLE TO SUIT ITEM 3.4	50mm Ø, 50mm Ø, 458	SANS 1123 - TABLE 1600/3
1.12	1	50 Ø PIPE THREE SEGMENT 90° BEND; TWO ENDS FLANGED, OTHER END SUITABLE FOR "KLAMFLEX" FLANGE ADAPTOR, WITH 50mm NIPPLE TO SUIT ITEM 3.5	50mm Ø, 50mm Ø, 50mm Ø, 365, 458	SANS 1123 - TABLE 1600/3
1.13	1	50 Ø PIPE BOTH ENDS FLANGED;WITH NIPPLE TO SUIT ITEM 3.4	50mm Ø, 50mm Ø, 1443	SANS 1123 - TABLE 1600/3
1.14	1	50 Ø PIPE BOTH ENDS ARE FLANGED AND THREE SEGMENT 90° BEND	50mm Ø, 50mm Ø, 50mm Ø, 519	SANS 1123 - TABLE 1600/3
1.15	1	50 Ø PIPE BOTH ENDS ARE FLANGED AND THREE SEGMENT 90° BEND	50mm Ø, 50mm Ø, 50mm Ø, 50	SANS 1123 - TABLE 1600/3
1.16	1	50 Ø PIPE BOTH ENDS FLANGED	50mm Ø, 503	SANS 1123 - TABLE 1600/3
1.17	1	50 Ø PIPE BOTH ENDS ARE FLANGED AND THREE SEGMENT 90° BEND	50mm Ø, 50mm Ø, R 3x confirmed (min 250mm), 200	SANS 1123 - TABLE 1600/3
2.1	6	50 Ø "KLAMFLEX" FLANGE ADAPTOR 1600 kPa WORKING PRESSURE	STANDARD (TO SUIT DRILLING ON XXXXXX)	SANS 1123 - TABLE 1600/3
3.1	8	50 Ø CAST IRON WATERWORKS GATE VALVE, WITH NON-RISING SPINDLE, RIGHT HAND CLOSING, HAND WHEEL OPERATED, WORKING PRESSURE 1600kPa	50mm Ø, 276	SANS 1123 - TABLE 1600/3
3.2	4	50 Ø "APCO/ZAL-DOSI OR SIMILAR APPROVED SLAM PROOF NOZZLE CHECK VALVE, BOTH ENDS FLANGED, WORKING PRESSURE 1600 kPa	50mm Ø, 320	SANS 1123 - TABLE 1600/3
3.3	1	50 Ø MEINECKE WP-DYNAMIC COLD FLANGED MECHANICAL TURBINE WATER METER WITH 1600kPa WORKING PRESSURE AND 22m³/h CONTINUOUS FLOW CAPACITY.	50mm Ø, 200	SANS 1123 - TABLE 1600/3
3.4	2	GLYCERINE FILLED PRESSURE GAUGE WITH 100mm DIAL FACE, 0-1000 kPa RANGE MOUNTED ON STOPCOCK TO SUIT NIPPLE ON ITEM 1.13 AND 1.19	STANDARD	
3.5	1	50mm ON "VENT-O-MAT REX" DOUBLE ACTING AIR VALVE MOUNTED ON STOPCOCK TO SUIT NIPPLE ON ITEM 1.12	STANDARD	

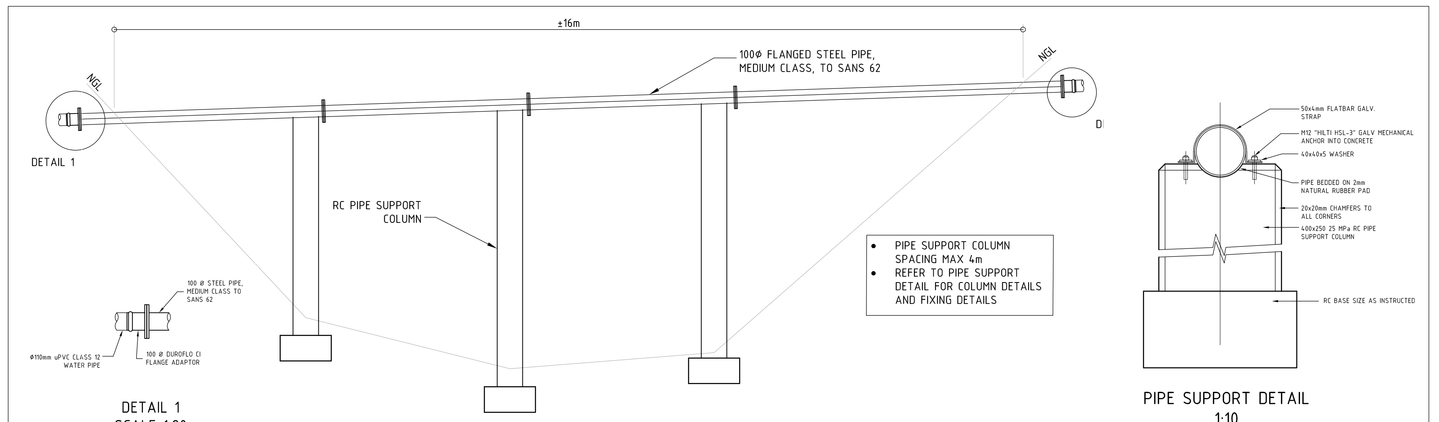
NOTES:

1. ALL DIMENSIONS OF SPECIAL FITTINGS (ITEMS MARKED 3.X) TO BE CONFIRMED WITH MANUFACTURERS BEFORE MANUFACTURING OF FABRICATED FITTING (ITEMS MARKED 3.X SERIES) COMMENCE. ADJUST DIMENSIONS IN SCHEDULE IF DIMENSIONS OF SPECIAL FITTING DEVIATES FROM THOSE INDICATED.
2. DIMENSIONS OF MANUFACTURED PIPE FITTINGS SHOWN DO NOT ALLOW FOR PACKINGS AND GAPS REQUIRED FOR COUPLINGS AND MUST BE ADJUSTED BY MAKING THE NECESSARY DEDUCTIONS TO LENGTHS.
3. A TRIAL ASSEMBLY TO BE CARRIED OUT TO DETERMINE THE EXACT POSITIONS OF PIPE SUPPORTS AND PUMP BASES.
4. STEEL PIPES TO BE COATED WITH "3M SCHOTCHKOTE 162 PWX" OR SIMILAR EPOXY COATING TO A THICKNESS OF 500MICRON.
5. PIPEWORK TO BE COATED WITH 2 COATS GLOSS ENAMEL TO THE COLOR SPECIFIED BY THE ENGINEER.
6. ALL FLANGES TO BE IN ACCORDANCE WITH SANS 1123 TABLE 3.
7. WORKING PRESSURE OF PIPE FITTINGS TO BE AT LEAST THE SAME OF THE WORKING PRESSURE OF THE FLANGES.



PUMP STATION LAYOUT
SCALE 1:20

REFER TO DRAWING NO E457-101 FOR BUILDING



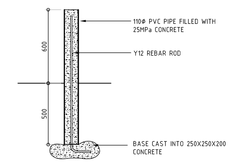
DETAIL 1
SCALE 1:20

TYPICAL PIPE BRIDGE SECTION
SCALE 1:50

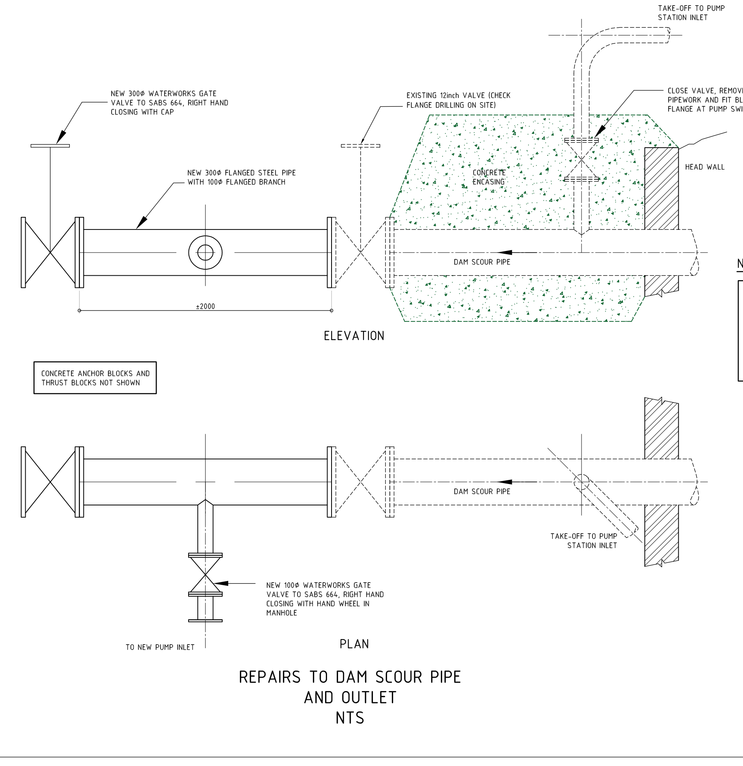
PIPE SUPPORT DETAIL
1:10

NOTE:
PIPELINE MARKERS TO BE INSTALLED IN THE FOLLOWING POSITIONS

1. AT ALL BENDS AND CHANGE IN DIRECTION.
2. EVERY 75m ON STRAIGHTS.



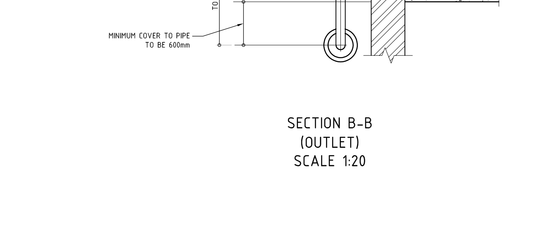
PIPELINE MARKER
Scale 1:25



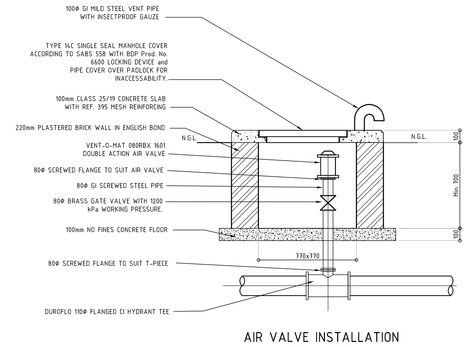
NOTES:

1. EXCAVATE AND CLEAN UP AROUND SCOUR PIPE AND FITTINGS, SAND BLAST TO REMOVE LOOSE CORROSION AND TREAT WITH SIKA FERROGARD-903 RUST INHIBITOR.
2. ENCASE WITH 30MPa CONCRETE TO ACHIEVE A MINIMUM COVER OF 400mm TO ANY PIPEWORK SURFACE.
3. CONCRETE TO BE TEMPERATURE AND SHRINKAGE COMPENSATED ELIMINATE CRACKS.

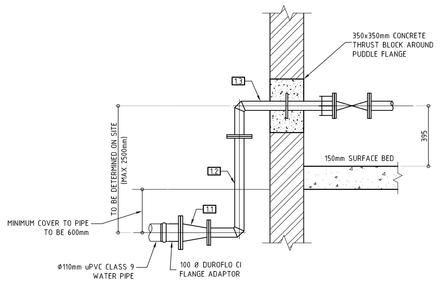
REPAIRS TO DAM SCOUR PIPE AND OUTLET
NTS



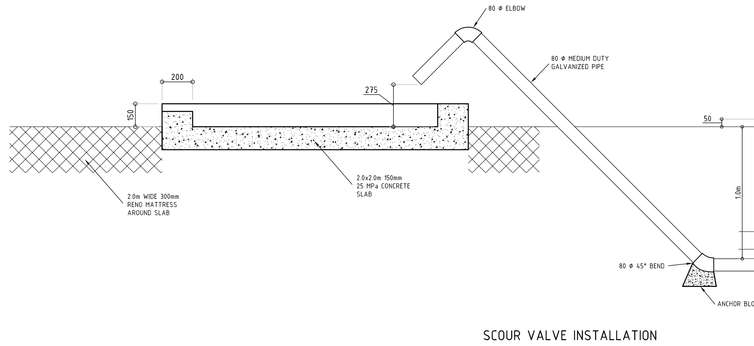
SECTION B-B
(OUTLET)
SCALE 1:20



AIR VALVE INSTALLATION
Scale 1:25



SECTION A-A
(INLET)
SCALE 1:20



SCOUR VALVE INSTALLATION
Scale 1:20

1 GENERAL NOTES:

1.1 All drawings to be read in conjunction with the architectural, mechanical, electrical and civil engineering drawings.
1.2 Refer to the drawings of the mechanical and electrical engineer for openings and services to be cast into concrete structures, slabs, floors and beams etc. The positions and dimensions of these openings must be approved by the engineer prior to placing the concrete.
1.3 All dimensions to be checked on site before construction of the affected components commences. Any discrepancies must be reported to the engineer without delay.
1.4 Drawings must not be scaled.
1.5 The design on this drawing remains the property of the CSE Consulting (Pty) Ltd, copyright is reserved.

2 GENERAL APPLICABLE STANDARDS AND SPECIFICATIONS:

The contractor must obtain a hardcopy of all relevant part of the SANS 2001 series before construction commences.

2.1 Earthworks to be done in accordance with SANS 2001-BE1:2008
2.2 Road and paving layers works to be in compliance with SANS
2.3 Structural concrete work to be in compliance with SANS 2001-CC1:2012
2.4 Formwork to be in accordance with SANS 2001-CC2
2.5 Foundations, rafts, strip footings and bases to be in compliance with SANS 2001-CM2:2011
2.6 Structural steel work to be in accordance with SANS 2001-CS1:2012
2.7 Timber roof structures to be in accordance with SANS 2001-CT2: 2011
2.8 Earthworks and bedding of pipes and culverts to be in accordance with SANS 2001-DP1: 2011
2.9 Water pipes to be in accordance with SANS 2001-DP3: 2010
2.10 Sewer installations to be in compliance with SANS 2001-DP4:2010 and SANS 0400.
2.11 Storm water structures and systems to be in accordance with SANS 2001-DP5:2010.
2.12 Precast concrete paving to be in accordance with SANS 1200 MJ (Segmented Paving)
2.13 Kerbing and channelling in accordance with SANS 1200 MK (Kerbing and Channelling).

3. CONCRETE WORK:

3.1. GENERAL:

- All concrete work to be carried out in accordance with SANS 2001-CC1:2012 Edition 1.1.
- Levels indicated on structural drawing are finished concrete levels (TOC).
- Concrete mix designs and samples aggregates to be submitted to the engineer for prior approval.
- Concrete mixes to be designed to be within the slump limits indicated in Table 4 of SANS 2001-CC1.
- Concrete cube testing to be taken at frequencies indicated in Clause 5.13 of SANS 2001-CC1.
- Contractor to provide 30 MPa concrete cover blocks to ensure correct cover and position of reinforcing.
- Fabricated mesh reinforcing shall be securely supported on either concrete spacer blocks or mild steel bar chairs. No depth control by hand is acceptable. Mesh to be installed strictly in accordance with the depth positioning on the drawings. If not indicated, the cover to mesh reinforcing will be 30mm.
- Reinforcing fixed in final positions to be inspected and approved in writing by the engineer before concrete is cast.
- Concrete to be cured for the length of time specified in Table 8 of SANS 2001-CC1.
- All excavations to be approved in writing by the engineer before any concrete for foundations is cast.
- Positions of construction joints in concrete are subject to the prior approval of the engineer.
- No deviations from structural drawings or alterations to the structure permitted without the written consent of the engineer.

3.2. CONCRETE STRENGTHS:

In instances where cube strengths of concrete components are not specified on drawings, the 28th day on cube strength to be as follows:

UNREINFORCED COMPONENTS:

A	Strip foundations	25 MPa
B	Surface Beds	25 MPa
C	Walkways	25 MPa
D	Mass concrete infills under foundations	10 MPa
E	Pipe Concrete encasing	20 MPa
F	Equipment Plinths	25 MPa
G	Power floated industrial floors	35 MPa
H	Concrete Hardstands and paving	30 MPa

REINFORCED COMPONENTS:

A	RC strip foundations	25 MPa
B	RC foundations and bases	30 MPa
C	RC columns	30 MPa
D	RC beams and slabs	30 MPa
E	RC raft foundations	30 MPa
F	RC Retaining walls	30 MPa
G	RC infills in masonry retaining walls	25 MPa
H	Piling	(subject to approval of the engineer)
I	Pile caps	30 MPa

CONCRETE COVER TO REINFORCING:

A	Suspended slab soffit	30mm
B	Top of suspended slabs	20mm
C	Suspended beam, sides and soffits	30mm
D	Ground beam earth surfaces	50mm
E	Pile caps	50mm
F	Retaining walls	50mm
G	Bases	50mm
H	Vertical bars in walls	30mm
I	Main bars in earth surfaces	50mm
J	Piles	(subject to approval of the engineer)

3.3. DESIGN LOADS:

- Concrete slabs and beams are designed for a live load in accordance with SANS 10160.
- Concrete stairs and landings are designed for a live loads of 3.0 kN/m2 in accordance with SANS 10160.
- Structures must not be overloaded by storage of construction materials on slabs or other means.

3.4. DEGREE OF ACCURACY:

- Tolerances to be within the limits of Degree of Accuracy 8 in Table 11 of SANS 2001-CC1.
- All surfaces formed with smooth shuttering or steel floated (ST) to be to within Degree of Accuracy 1.
- All concrete floors that will not receive a topping to be within Degree of Accuracy 1.

3.5. PROPPING:

- No shuttering or propping to be taken out without written consent of the engineer.
- No propping to be taken out before proof or concrete strength in members is submitted and approved by the engineer.

4. MASONRY:

All masonry to comply SANS 2001-CM1: 2012 Edition 1.1: Masonry Walling.

Load bearing brickwork are any of the following:

A Walls designated as load bearing on the drawings.
B Any external wall.
C Any retaining wall with soil with level difference greater than 300mm between the front and rear of the wall.
D Supporting walls of double storey buildings or higher.
E Any walls designated to be constructed of NFX class clay bricks.
F Any cavity wall higher than 4.5m
G Any 220mm wall higher than 3.6m

- All load bearing brickwork and masonry to have a minimum compressive strength of 7MPa.
- Mortar in load bearing brickwork to be Class 1.
- Masonry units to have a water absorptions of less than 7%.
- The maximum spacing of wall ties in cavity walls are not to be greater than 400mm horizontally and vertically.
- No wall ties other than galvanized metal is permitted.
- Brick force to consist of two longitudinal wires with a minimum diameter of 2.88mm.

Brick force in walls to be installed at the following intervals:

A Every 2nd layer in foundation walls.
B Every 4th course between DPC and lintel level.
C Every 2nd course between lintel level and first floor slab.
D Every 4th course between first floor slab and lintel level.
E Every 2nd course above lintel level to wall plate/roof.
F Every 4th course in cable or partition walls above lintel level.

5. LIGHTLY LOADED SURFACE BEDS:

THIS SPECIFICATION IS **ONLY** APPLICABLE TO LIGHTLY LOADED SURFACE BEDS ON GRADE NOT THICKER THAN 100mm AND RECEIVING SCREEDS WITH FLEXIBLE FLOOR COVERING, E.G. VINYL TILING OR TIMBER FLOOR BOARDS. THIS SPECIFICATION IS **NOT** APPLICABLE TO INDUSTRIAL FLOORS, CONCRETE HARDSTANDS, FLOORS OF RAFT FOUNDATIONS OR SURFACE BEDS WITH RIGID COVERINGS LIKE CERAMIC TILING.

A) SURFACE BEDS BE COMPLIANT WITH SANS 2001-CC1:2012 AND SANS-2001-CC2:2007 ALL FINISHED LEVELS OF CONCRETE FLOORS BEFORE RECEIVING TOPPING TO BE WITHIN THE TOLERANCES OF FLOOR CLASSIFICATION FM3 ACCORDING TO TR34.
B) REINFORCING TO BE INSTALLED ACCORDING TO THE SPECIFICATIONS ON THE DRAWINGS. FABRIC MESH AND REINFORCING TO BE SUPPORTED ON SADDLES OR COVER BLOCKS AT INTERVALS SUFFICIENTLY CLOSE TO ENSURE CORRECT POSITIONING AND COVER IN THE FLOOR.
C) STAGE 1: SURFACE BEDS MUST BE CAST IN CHECKER BOARD PANELS WITH DIMENSIONS NOT GREATER THAN 3.0M ON ANY EDGE. THE ARRANGEMENT OF THESE PANELS MUST BE PLANNED PROPERLY. THE RATIO BETWEEN THE LONGEST AND SHORTEST EDGE OF ANY PANEL SHOULD NOT EXCEED 1.25.
D) THE REINFORCING SHOULD BE ARRANGED TO PROTRUDE NOT LESS THAN 300MM FROM ANY EDGE OF A STAGE 1 PANEL. REINFORCING MUST NOT OVERLAP WITH ANY PANEL CAST AT THE SAME TIME.
E) EDGES OF STAGE 1 PANELS MUST BE SHUTTERED TO AT LEAST THE UNDERSIDE OF THE REINFORCING TO OBTAIN A FAIRLY STRAIGHT EDGE.
G) THE CASTING OF THE REMAINING STAGE 2 FLOOR PANELS IN BETWEEN THE PANELS CAST UNDER STAGE 1 MUST NOT BE CAST EARLIER THAN 7 DAYS. THE EDGES OF STAGE 1 PANELS THAT WILL BUTT UP AGAINST STAGE 2 PANELS MUST BE TREATED AS A CONSTRUCTION JOINT ACCORDING TO SANS 2001-CC1:2012, TABLE 7 METHOD 3. A "WET-TO-DRY" AGENT APPROVED BY THE ENGINEER MAY ALSO BE USED.
H) SURFACES TO BE WOOD FLOATED, READY TO RECEIVE TOPPING.

B-324

N:\PROJECTS\E765-Tafalofefe Civils Completion\Drawings 2020_Tender\E765-110 Pump Station and Pipeline Installations 2020-09-07 As Built.dwg | WS3 | 2020/09/07 09:47

NR.	DATE	REVISIONS	DRAWN	PK
0	2021/05/17	FOR INFORMATION	DATE	AUGUST 2019
			CHECKED	JPCvW
			SCALE	AS SHOWN

CLIENT DEPARTMENT
health
Department: Health
REPUBLIC OF SOUTH AFRICA

IMPLEMENTING AGENT
DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE

PROJECT
TAFALOFEFE HOSPITAL : WATER AND WASTEWATER TREATMENT

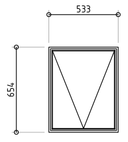
DRAWING
PUMP STATION & PIPELINE INSTALLATIONS

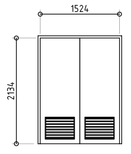
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CIVIL STRUCTURAL ENGINEERS

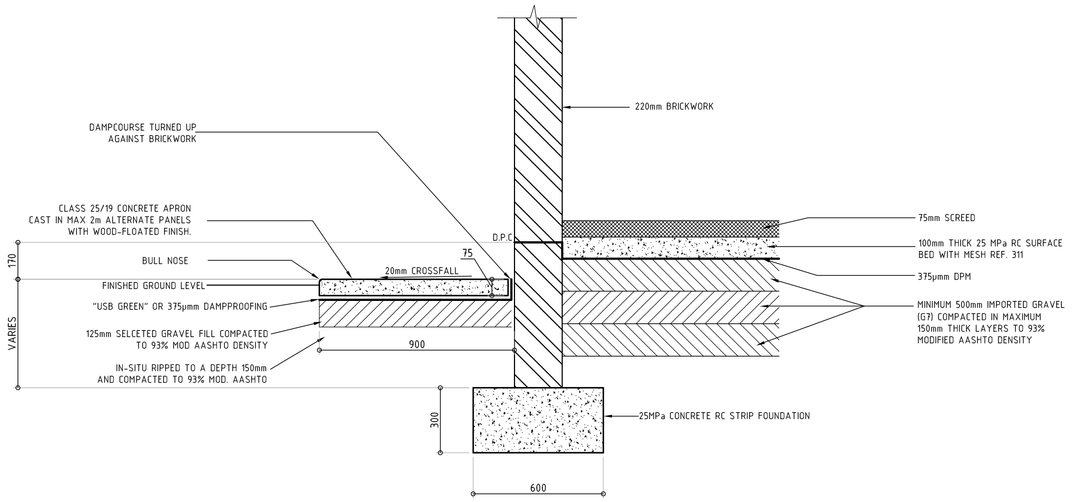
PROJECT NO
E765

DWG NO.
110

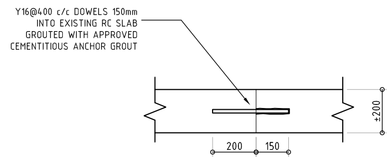
REV
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Window Schedule	W1 
Description:	533 x 654 E1
Finishes:	Steel frame to be painted with two coats enamel.
Glazing:	3mm Safety glazing (frosted)
Amount:	4

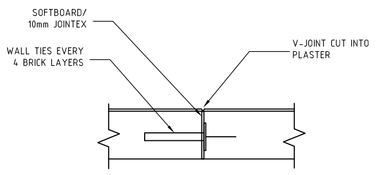
Door Schedule	D1 
Description:	1524 x 2134 double steel frame and transformer room door with ventilators.
Finishes:	Door and frame to be painted with two coats gloss enamel.
Glazing:	None
Amount:	1



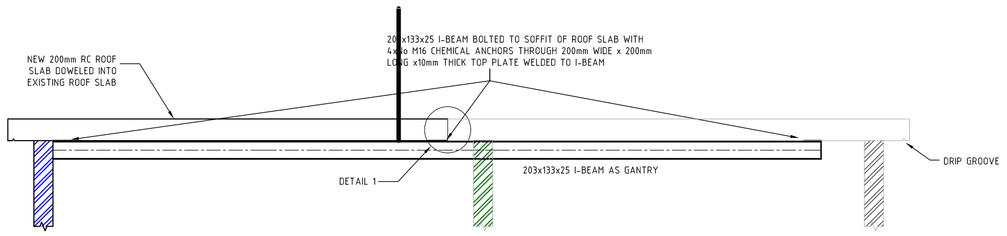
SECTION B-B
SCALE 1:20

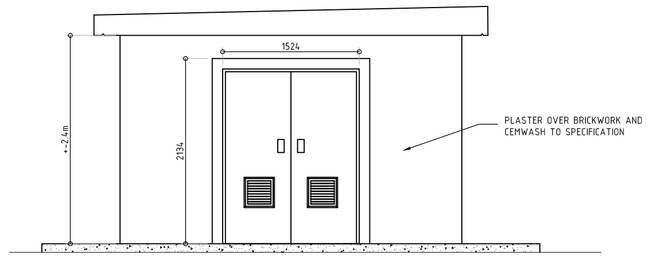


DETAIL 1
RC SLAB CONNECTION DETAIL
SCALE 1:20

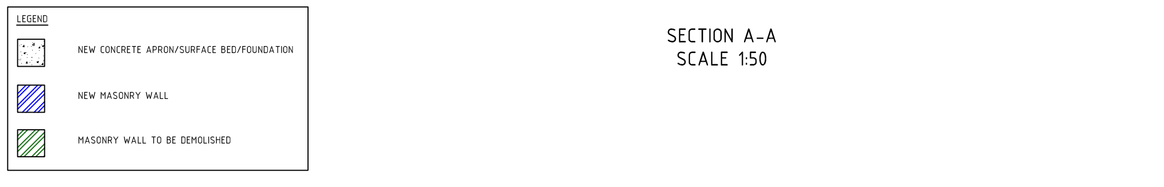


DETAIL 2
MASONRY WALL JOINT DETAIL
SCALE 1:20

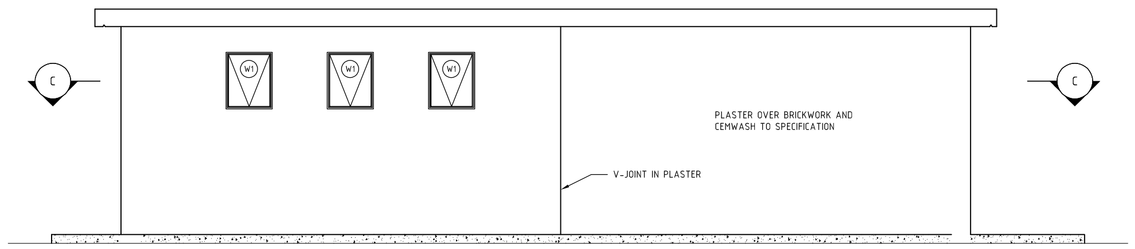




FRONT ELEVATION
SCALE 1:50

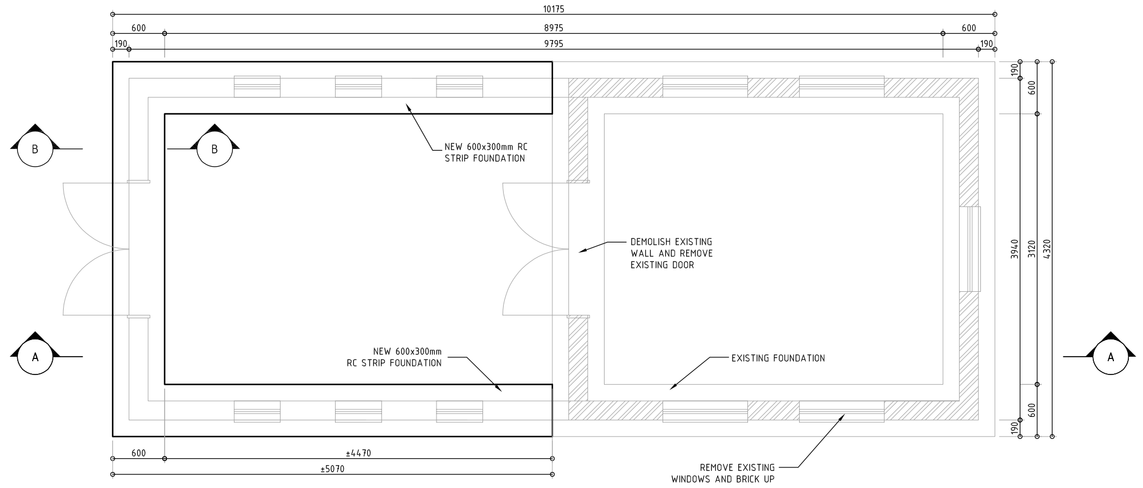


SECTION A-A
SCALE 1:50

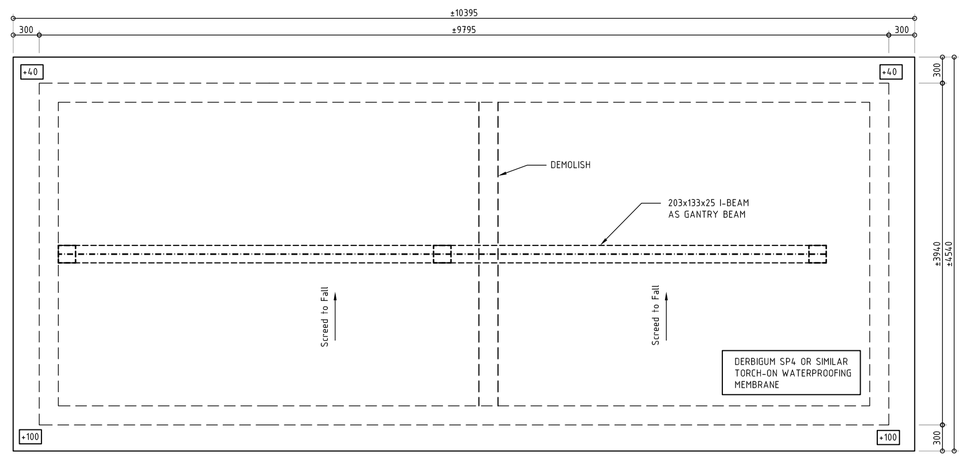


SIDE ELEVATION
SCALE 1:50

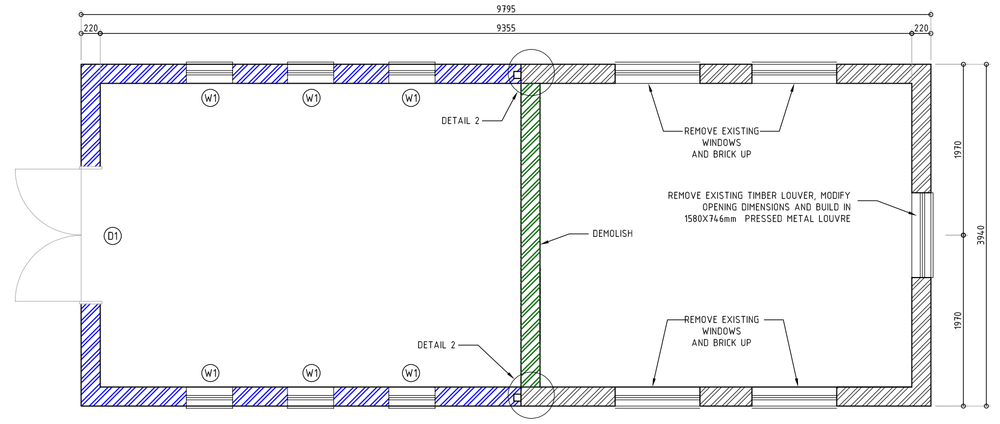
LEGEND
- NEW CONCRETE APRON/SURFACE BED/FOUNDATION
- NEW MASONRY WALL
- MASONRY WALL TO BE DEMOLISHED



FOUNDATION LAYOUT
SCALE 1:50



ROOF LAYOUT
Scale 1:50



SECTION C-C
SCALE 1:50

1 GENERAL NOTES:

1.1 All drawings to be read in conjunction with the architectural, mechanical, electrical and civil engineering drawings.
1.2 Refer to the drawings of the mechanical and electrical engineer for openings and services to be cast into concrete structures, slabs, floors and beams etc. The positions and dimensions of these openings must be approved by the engineer prior to placing the concrete.
1.3 All dimensions to be checked on site before construction of the affected components commences. Any discrepancies must be reported to the engineer without delay.
1.4. Drawings must not be scaled.
1.5 The design on this drawing remains the property of the CSE Consulting (Pty) Ltd, copyright is reserved.

2 GENERAL APPLICABLE STANDARDS AND SPECIFICATIONS:

The contractor must obtain a hardcopy of all relevant part of the SANS 2001 series before construction commences.

2.1 Earthworks to be done in accordance with SANS 2001-BE1:2008
2.2 Road and paving layers works to be in compliance with SANS
2.3 Structural concrete work to be in compliance with SANS 2001-CC1:2012
2.4 All masonry walling to comply with SANS 2001-CM1:2011
2.5 Foundations, rafts, strip footings and bases to be in compliance with SANS 2001-CM2:2011
2.6 Structural steel work to be in accordance with SANS 2001-CS1:2012
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2.8 Earthworks and bedding of pipes and culverts to be in accordance with SANS 2001-DP1: 2011
2.9 Water pipes to be in accordance with SANS 2001-DP2: 2010
2.10 Sewer installations to be in compliance with SANS 2001-DP4:2010 and SANS 0400.
2.11 Storm water structures and systems to be in accordance with SANS 2001-DP5:2010.
2.12 Precast concrete paving to be in accordance with SANS 1200 MJ (Segmented Paving)
2.13 Kerbing and channelling in accordance with SANS 1200 MK (Kerbing and Channelling).

3. CONCRETE WORK:

3.1. GENERAL:

- All concrete work to be carried out in accordance with SANS 2001-CC1:2012 Edition 1.1.
- Levels indicated on structural drawing are finished concrete levels (TOC).
- Concrete mix designs and samples aggregates to be submitted to the engineer for prior approval.
- Concrete mixes to be designed to be within the slump limits indicated in Table 4 of SANS 2001-CC1.
- Concrete cube testing to be taken at frequencies indicated in Clause 5.13 of SANS 2001-CC1.
- Contractor to provide 30 MPa concrete cover blocks to ensure correct cover and position of reinforcing.
- Fabricated mesh reinforcing shall be securely supported on either concrete spacer blocks or mild steel bar chairs. No depth control by hand is acceptable. Mesh to be installed strictly in accordance with the depth positioning on the drawings. If not indicated, the cover to mesh reinforcing will be 30mm.
- Reinforcing fixed in final positions to be inspected and approved in writing by the engineer before concrete is cast.
- Concrete to be cured for the length of time specified in Table 8 of SANS 2001-CC1.
- All excavations to be approved in writing by the engineer before any concrete for foundations is cast.
- Positions of construction joints in concrete are subject to the prior approval of the engineer.
- No deviations from structural drawings or alterations to the structure permitted without the written consent of the engineer.

3.2. CONCRETE STRENGTHS:

In instances where cube strengths of concrete components are not specified on drawings, the 28th day on cube strength to be as follows:

UNREINFORCED COMPONENTS:

A	Strip foundations	25 MPa
B	Surface Beds	25 MPa
C	Walkways	25 MPa
D	Mass concrete infills under foundations	10 MPa
E	Pipe Concrete encasing	20 MPa
F	Equipment Plinths	25 MPa
G	Power floated industrial floors	35 MPa
H	Concrete Hardstands and paving	30 MPa

REINFORCED COMPONENTS:

A	RC strip foundations	25 MPa
B	RC foundations and bases	30 MPa
C	RC columns	30 MPa
D	RC beams and slabs	30 MPa
E	RC raft foundations	30 MPa
F	RC Retaining walls	30 MPa
G	RC Infills in masonry retaining walls	25 MPa
H	Piling	(subject to approval of the engineer)
I	Pile caps	30 MPa

CONCRETE COVER TO REINFORCING:

A	Suspended slab soffit	30mm
B	Top of suspended slabs	20mm
C	Suspended beam, sides and soffits	30mm
D	Ground beam earth surfaces	50mm
E	Columns	35mm
F	Retaining walls	50mm
G	Bases	50mm
H	Vertical bars in walls	30mm
I	Main bars in earth surfaces	50mm
J	Piles	(subject to approval of the engineer)

3.3. DESIGN LOADS:

- Concrete slabs and beams are designed for a live load in accordance with SANS 10160.
- Concrete stairs and landings are designed for a live loads of 3,0 kN/m2 in accordance with SANS 10160.
- Structures must not be overloaded by storage of construction materials on slabs or other means.

3.4. DEGREE OF ACCURACY:

- Tolerances to be within the limits of Degree of Accuracy II in Table 11 of SANS 2001-CC1.
- All surfaces formed with smooth shuttering or steel floated (ST) to be within Degree of Accuracy I.
- All concrete floors that will not receive a topping to be within Degree of Accuracy I.

3.5. PROPPING:

- No shuttering or propping to be taken out without written consent of the engineer.
- No propping to be taken out before proof or concrete strength in members is submitted and approved by the engineer.

4. MASONRY:

All masonry to comply SANS 2001-CM1: 2012 Edition 1.1: Masonry Walling

Load bearing brickwork are any of the following:

A Walls designated as load bearing on the drawings.
B Any foundation wall.
C Any retaining wall with soil with level difference greater than 700mm between the front and rear of the wall.
D Supporting walls of double storey buildings or higher.
E Any walls designated to be constructed of NFX class clay bricks.
F Any cavity wall higher than 4.0m
G Any 220mm wall higher than 3.6m

- All load bearing brickwork and masonry to have a minimum compressive strength of 14MPa.
- Mortar in load bearing brickwork to be Class I.
- Masonry units to have a water absorptions of less than 7%.
- The maximum spacing of wall ties in cavity walls are not to be greater than 400mm horizontally and vertically.
- No wall ties other than galvanized metal is permitted.
- Brick force to consist of two longitudinal wires with a minimum diameter of 2.88mm.

Brick force in walls to be installed at the following intervals:

A Every 2nd layer in foundation walls.
B Every 4th course between DPC and lintol level.
C Every 2nd course between lintol level and first floor slab.
D Every 4th course between first floor slab and lintol level.
E Every 2nd course above lintol level to wall plate/roof.
F Every 4th course in cable or partition walls above lintol level.

5. LIGHTLY LOADED SURFACE BEDS:

THIS SPECIFICATION IS **ONLY** APPLICABLE TO LIGHTLY LOADED SURFACE BEDS ON GRADE NOT THICKER THAN 100mm AND RECEIVING SCREEDS WITH FLEXIBLE FLOOR COVERING, E.G. VINYL TILING OR TIMBER FLOOR BOARDS. THIS SPECIFICATION IS **NOT** APPLICABLE TO INDUSTRIAL FLOORS, CONCRETE HARDSTANDS, FLOORS OF RAFT FOUNDATIONS OR SURFACE BEDS WITH RIGID COVERINGS LIKE CERAMIC TILING.

A) SURFACE BEDS BE COMPLIANT WITH SANS 2001-CC1:2012 AND SANS-2001-CC2:2007.ALL FINISHED LEVELS OF CONCRETE FLOORS BEFORE RECEIVING TOPPING TO BE WITHIN THE TOLERANCES OF FLOOR CLASSIFICATION FM3 ACCORDING TO TR34.
B) REINFORCING TO BE INSTALLED ACCORDING TO THE SPECIFICATIONS ON THE DRAWINGS. FABRIC MESH AND REINFORCING TO BE SUPPORTED ON SADDLES OR COVER BLOCKS AT INTERVALS . SUFFICIENTLY CLOSE TO ENSURE CORRECT POSITIONING AND COVER IN THE FLOOR.
C) STAGE 1: SURFACE BEDS MUST BE CAST IN CHECKER BOARD PANELS WITH DIMENSIONS NOT GREATER THAN 3,3M ON ANY EDGE. THE ARRANGEMENT OF THESE PANELS MUST BE PLANNED PROPERLY. THE RATIO BETWEEN THE LONGEST AND SHORTEST EDGE OF ANY PANEL SHOULD NOT EXCEED 1.25.
D) THE REINFORCING SHOULD BE ARRANGED TO PROTRUDE NOT LESS THAN 300MM FROM ANY EDGE OF A STAGE 1 PANEL. REINFORCING MUST NOT OVERLAP WITH ANY PANEL CAST AT THE SAME TIME.
E) EDGES OF STAGE 1 PANELS MUST BE SHUTTERED TO AT LEAST THE UNDERSIDE OF THE REINFORCING TO OBTAIN A FAIRLY STRAIGHT EDGE.
G) THE CASTING OF THE REMAINING STAGE 2 FLOOR PANELS IN BETWEEN THE PANELS CAST UNDER STAGE 1 MUST NOT BE CAST EARLIER THAN 7 DAYS. THE EDGES OF STAGE 1 PANELS THAT WILL BUTT UP AGAINST STAGE 2 PANELS MUST BE TREATED AS A CONSTRUCTION JOINT ACCORDING TO SANS 2001-CC1:2012, TABLE 7 METHOD 3. A "WET-TO-DRY" AGENT APPROVED BY THE ENGINEER MAY ALSO BE USED.
HI SURFACES TO BE WOOD FLOATED, READY TO RECEIVE TOPPING.

B-335

NR.	DATE	REVISIONS
0	2021/05/17	FOR INFORMATION

DRAWN: PK
DATE: AUGUST 2019
CHECKED: JPCvW
SCALE: AS SHOWN

CLIENT DEPARTMENT
health
Department: Health
REPUBLIC OF SOUTH AFRICA

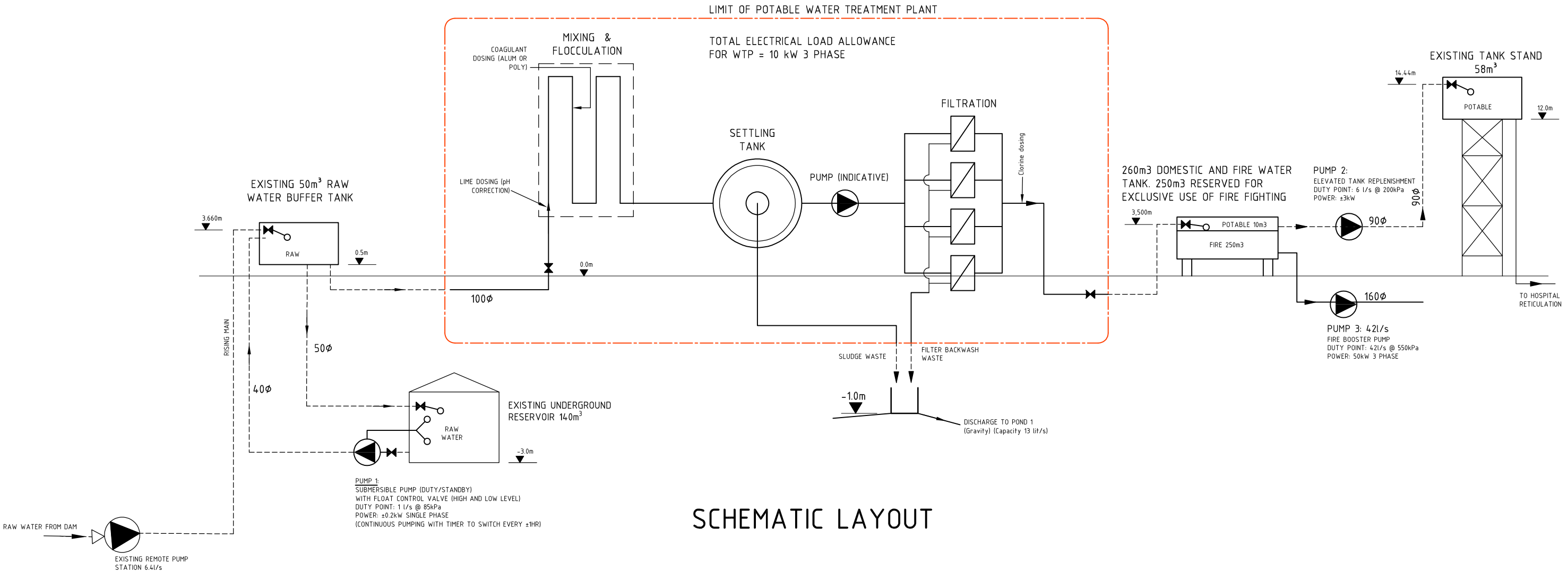
IMPLEMENTING AGENT
DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

DRAWING
PUMP STATION BUILDING

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PROJECT NO: *E765*
DWG NO.: *111*
REV: *0*



SCHEMATIC LAYOUT

E765 - WATER TREATMENT SCHEMATIC Version 4

B-336

N:\PROJECTS\E765 - Tafalofefe Civils Completion\Drawings 2023_Tender\E765-R01 Water Treatment Plant Schematic 2023-09-07.dwg | WS3 | 2023/09/07 09:12

NR.	DATE	REVISIONS
0	2020/07/20	DOCUMENTATION
1	2020/11/27	ADDITIONAL INFORMATION
2	2021/05/14	DOCUMENTATION
3	2023/09/07	DOCUMENTATION

DRAWN: CVW
DATE: JULY 2020
CHECKED: CVW
SCALE: NTS

CLIENT DEPARTEMENT: *EASTERN CAPE DEPARTMENT OF HEALTH*

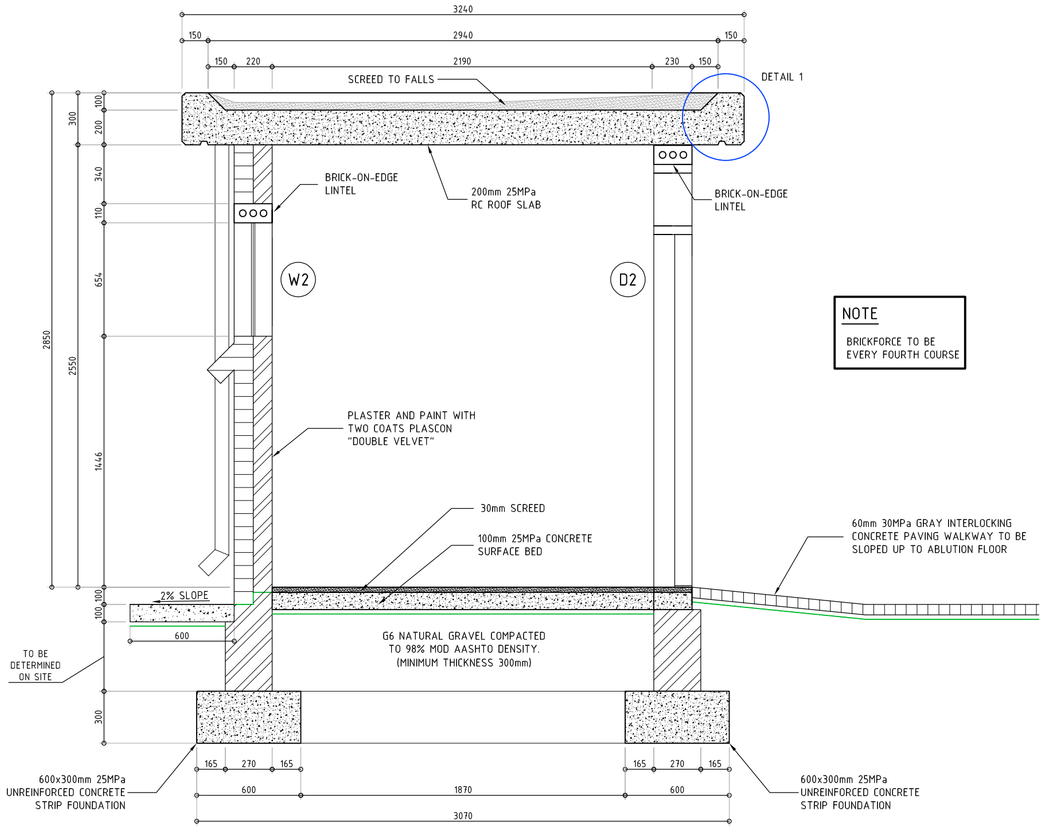
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PROJECT: *SCMU5-21/22-0018 TAFALOFEFE HOSPITAL : WATER AND WASTEWATER TREATMENT*

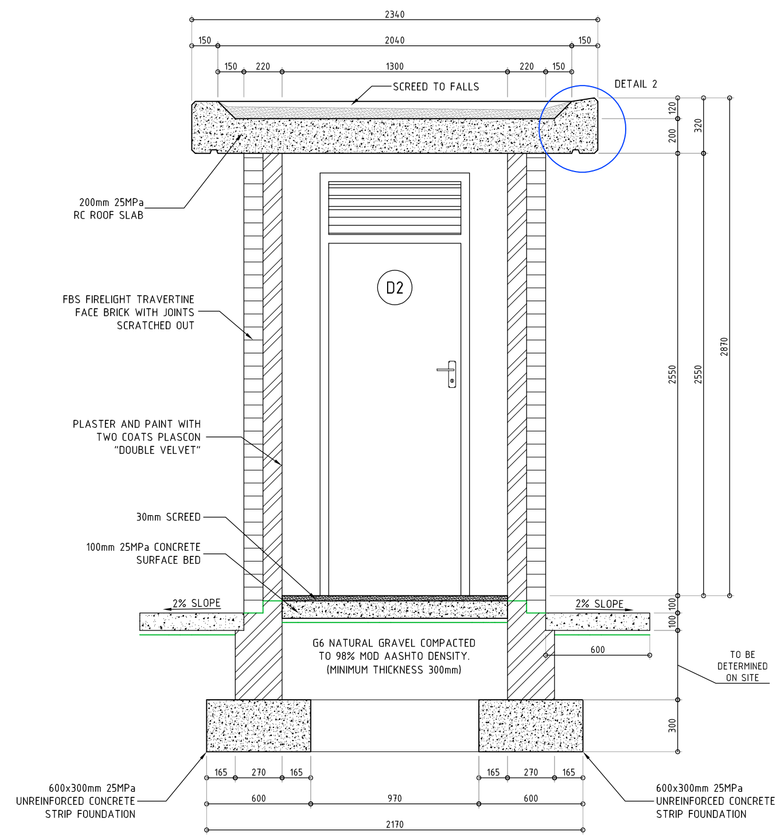
DRAWING: *NEW WATER TREATMENT WORKS : PROCESS SCHEMATIC*

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Bloemfontein
T : 082 373 1391
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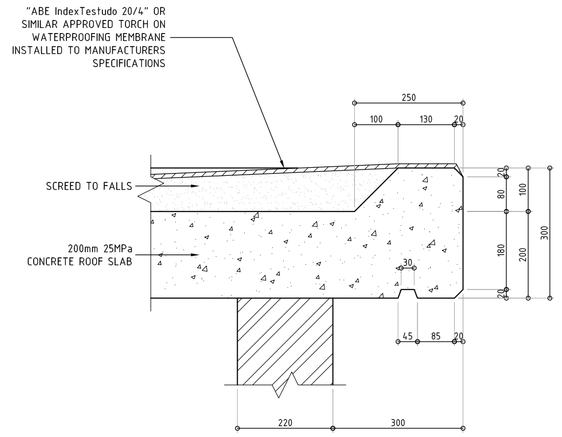
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DWG NO.: R01
REV: 3



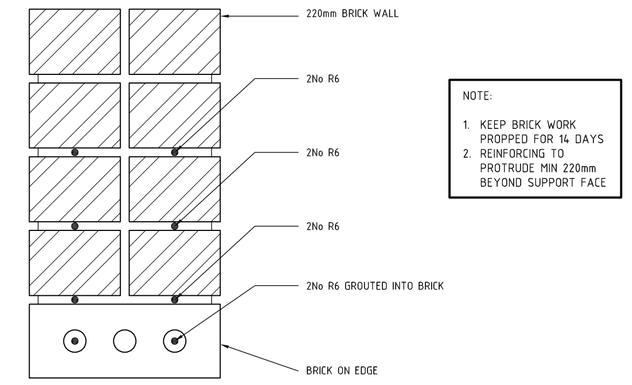
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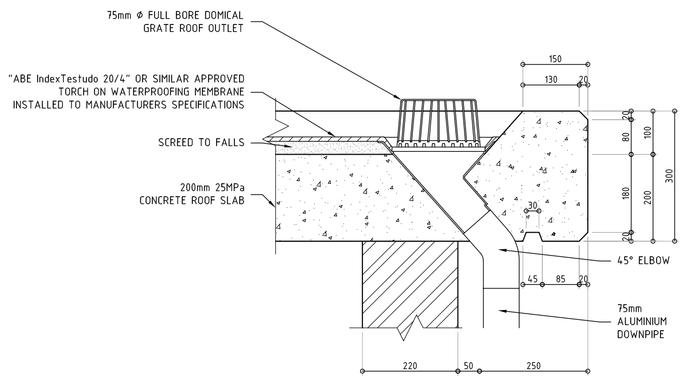
SECTION B-B
SCALE 1:25



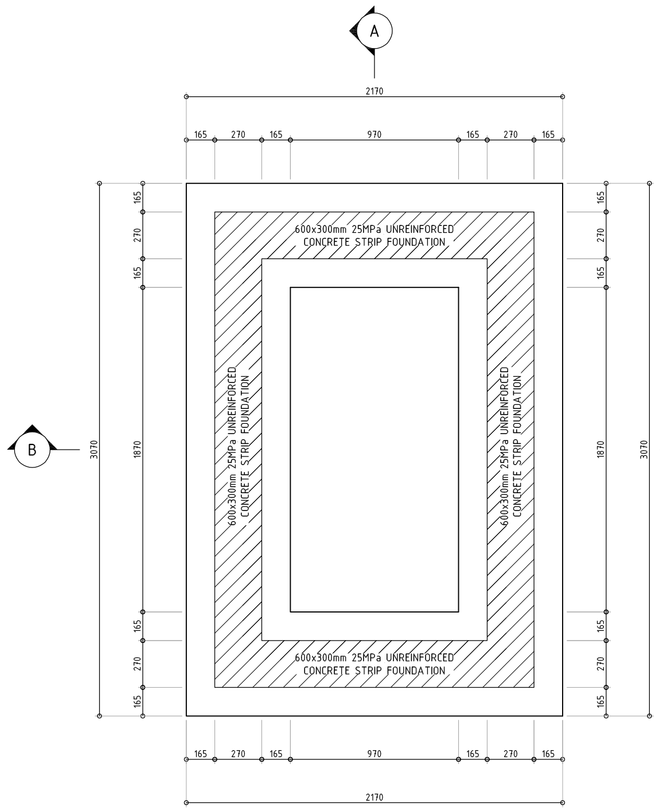
DETAIL 2
SCALE 1:10



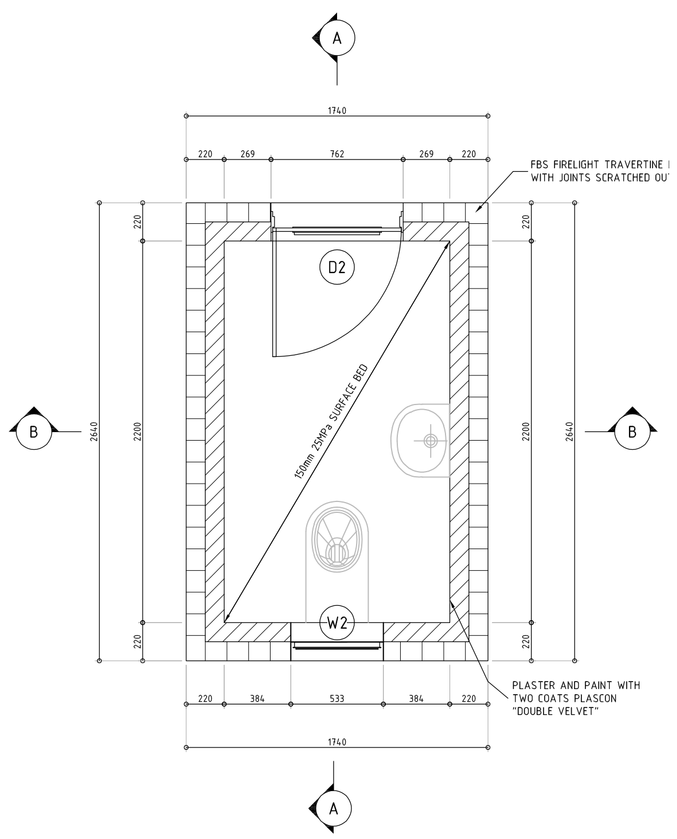
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SCALE 1:5



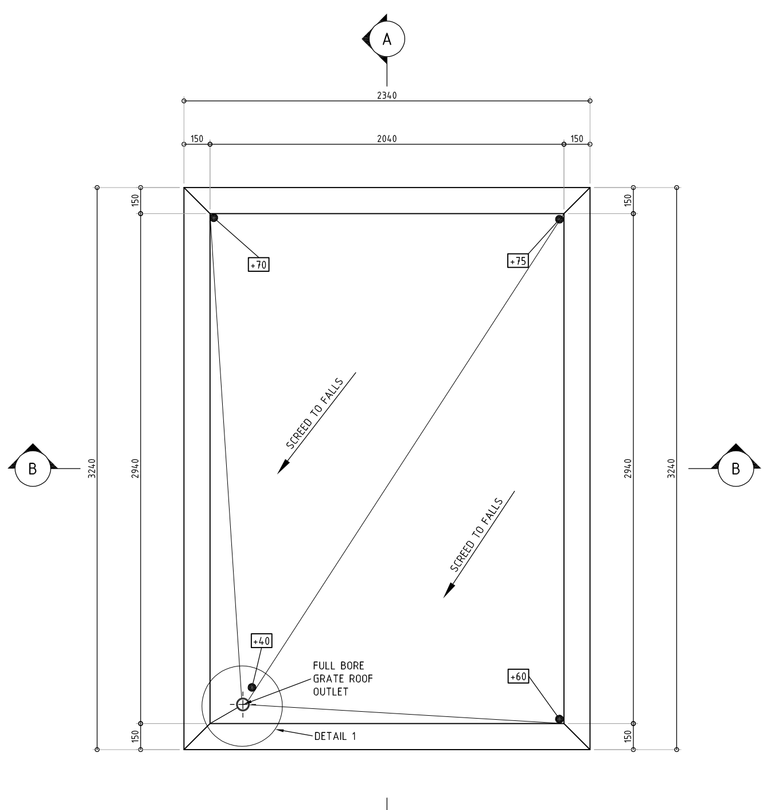
DETAIL 1
(RAINWATER OUTLET)
SCALE 1:10



FOUNDATION LAYOUT
SCALE 1:25

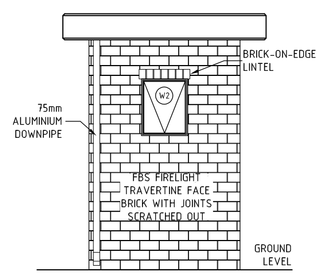


SURFACE BED LAYOUT
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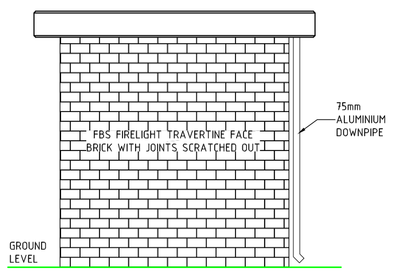


ROOF SLAB LAYOUT
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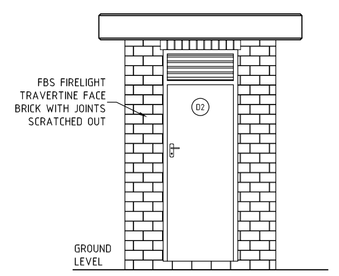
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XXX THICKNESS OF SCREED TO FALLS ON ROOFS



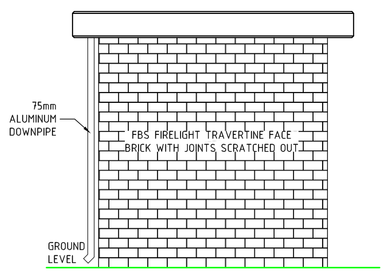
REAR ELEVATION
SCALE 1:50



LEFT ELEVATION
SCALE 1:50



FRONT ELEVATION
SCALE 1:50



RIGHT ELEVATION
SCALE 1:50

B-337

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NR.	DATE	REVISIONS
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DRAWN: MK
DATE: JUNE 2016
CHECKED: JPCvW
SCALE: AS SHOWN

ARCHITECT

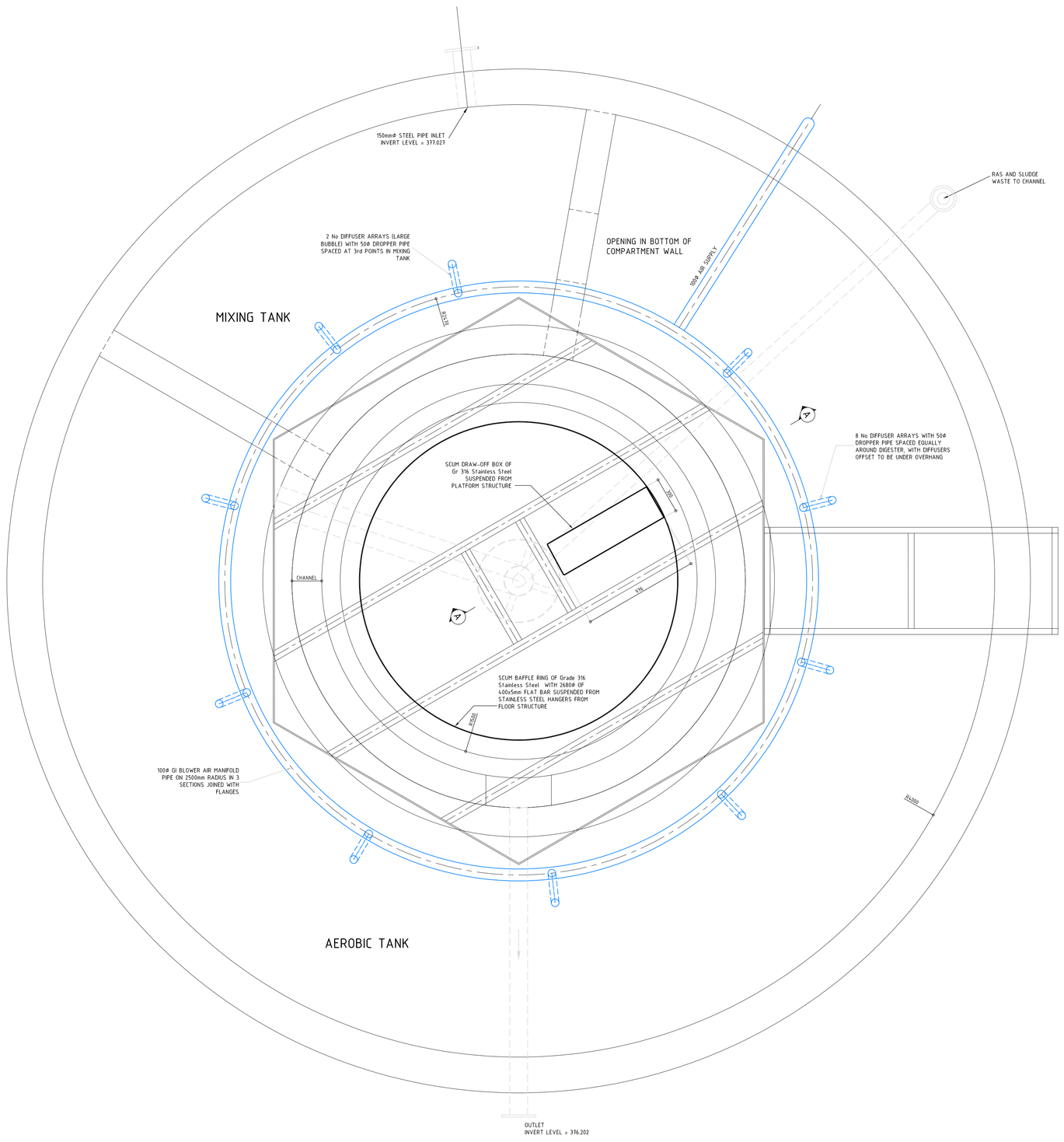
CLIENT
health
Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL:WATER AND WASTEWATER TREATMENT

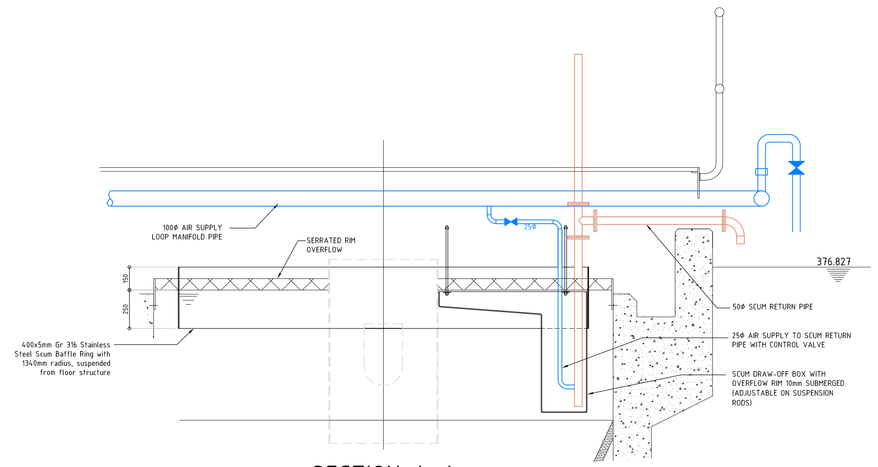
DRAWING
ABLUTION

CSE CONSULTING (Pty) Ltd
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Bloemfontein
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CIVIL STRUCTURAL ENGINEERS

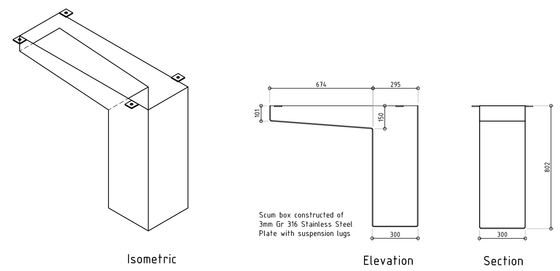
PROJECT NO: *E765*
DWG NO.: *104*
REV: *0*



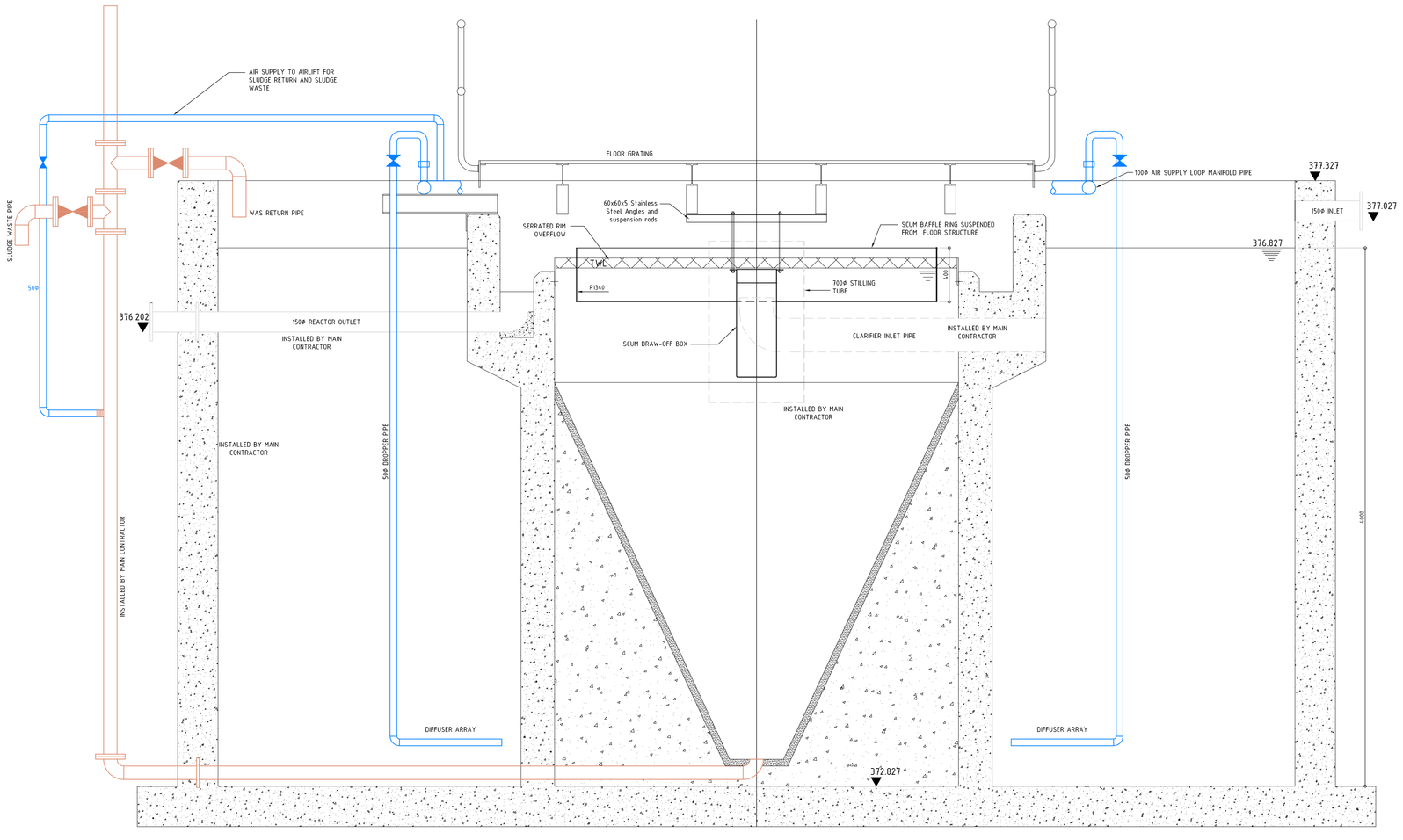
PLAN
1:20



SECTION A-A
1:20



SCUM BOX
1:20



TYPICAL SECTION
1:20

B-338

N:\PROJECTS\E765-Tafalofefe Civils Completion\Drawings 2023_Tender\E765-105 Sewage Treatment Works_Reactor Mechanical Installations 2023-09-07.dwg | WS3 | 2023/09/07 09:40

NR.	DATE	REVISIONS
0	2021/05/05	FOR TENDER
1	2023/09/07	DOCUMENTATION

DRAWN: PK
DATE: 2021-05-05
CHECKED: JPCvw
SCALE: AS SHOWN

ARCHITECT

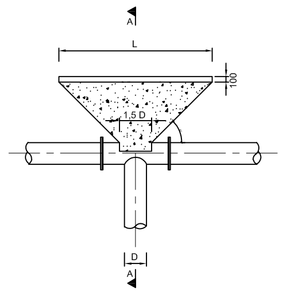
CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT

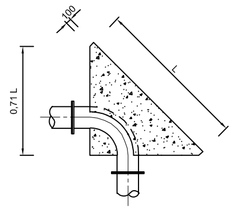
DRAWING
SEWAGE TREATMENT WORKS:REACTOR MECHANICAL INSTALLATIONS

CSE CONSULTING (Pty) Ltd
East London
T : 043 726 3565
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Bloemfontein
T : 082 373 1391
E : bfn@cse-consult.co.za
CIVIL STRUCTURAL ENGINEERS

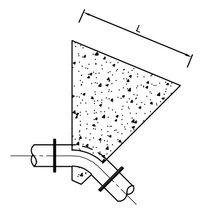
PROJECT NO: *E765*
Drawing Size: A0
DWG NO.: *105*
REV: *1*



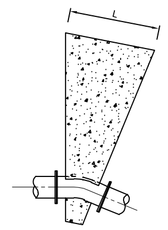
PLAN VIEW



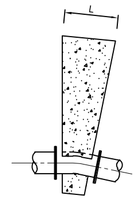
PLAN VIEW



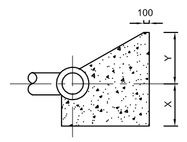
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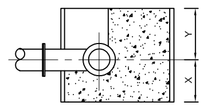
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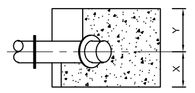
PLAN VIEW



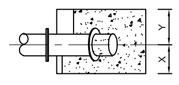
SECTION
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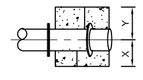
ELEVATION
90° BEND



ELEVATION
45° BEND



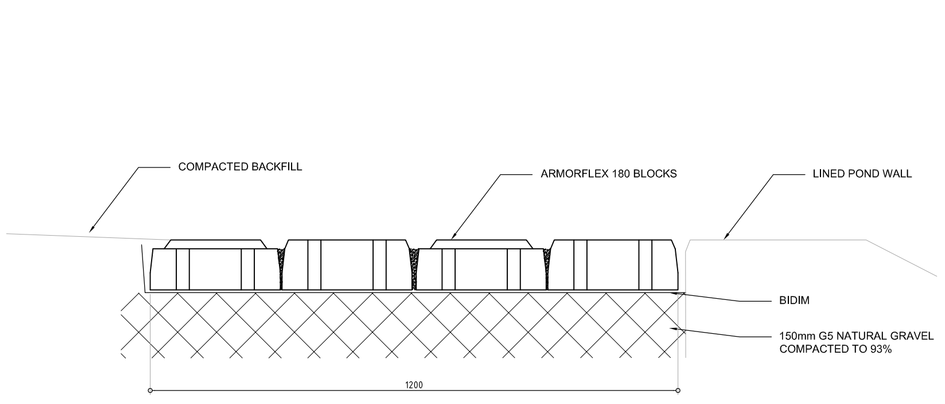
ELEVATION
22.5° BEND



ELEVATION
11.25° BEND

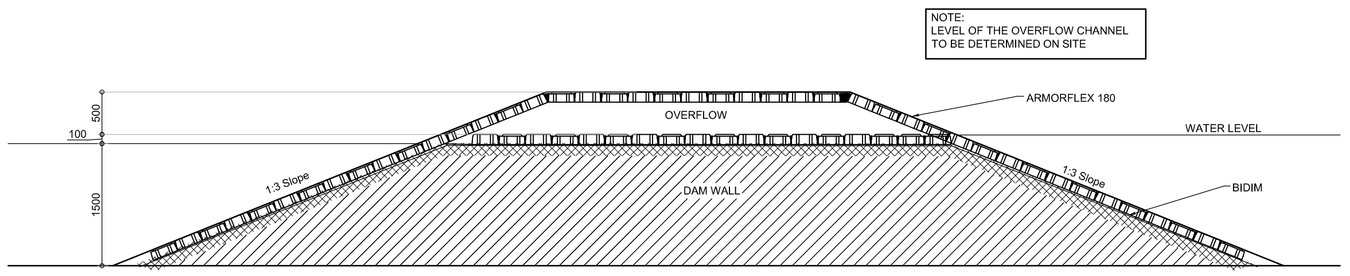
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50	L	0,528	0,427	0,358	0,351	0,567	0,430	0,325	0,268	0,568	0,572	0,437	0,364	0,710	0,511	0,545	0,454	0,700	0,649	0,481	0,348	0,774	0,539	0,539	0,383	0,847	0,589	0,550	0,418	1,032	0,717	0,487	0,510
	X	0,225	0,194	0,143	0,102	0,266	0,225	0,184	0,143	0,307	0,225	0,184	0,143	0,307	0,266	0,184	0,143	0,348	0,266	0,225	0,184	0,348	0,307	0,307	0,184	0,348	0,307	0,225	0,184	0,348	0,307	0,266	0,184
	Y	0,275	0,225	0,175	0,125	0,325	0,275	0,225	0,175	0,375	0,275	0,225	0,175	0,375	0,325	0,225	0,175	0,425	0,325	0,275	0,225	0,425	0,375	0,375	0,225	0,425	0,375	0,275	0,225	0,425	0,375	0,325	0,225
75	L	0,598	0,590	0,441	0,356	0,705	0,639	0,450	0,330	0,939	0,648	0,599	0,441	1,174	0,635	0,545	0,552	1,197	0,804	0,689	0,478		0,890	0,890	0,528	1,450	0,974	0,633	0,578	1,452	1,186	0,604	0,510
	X	0,317	0,235	0,194	0,153	0,358	0,276	0,235	0,194	0,358	0,317	0,235	0,194	0,358	0,358	0,276	0,194	0,399	0,358	0,276	0,235	0,399	0,358	0,358	0,235	0,399	0,358	0,317	0,235	0,440	0,358	0,358	0,276
	Y	0,388	0,287	0,237	0,187	0,438	0,337	0,287	0,237	0,438	0,388	0,287	0,237	0,438	0,438	0,337	0,237	0,488	0,438	0,337	0,287	0,488	0,438	0,438	0,287	0,488	0,438	0,338	0,287	0,536	0,438	0,438	0,337
90 • 110	L	0,789	0,706	0,489	0,354	1,183	0,641	0,540	0,529	1,276	0,854	0,550	0,491	1,321	1,067	0,689	0,615	1,672	1,352	0,689	0,572	1,553	1,210	1,210	0,633	1,701	1,325	0,834	0,697	1,764	1,334	1,016	0,646
	X	0,368	0,286	0,245	0,204	0,368	0,368	0,286	0,204	0,409	0,368	0,327	0,245	0,450	0,368	0,327	0,245	0,450	0,368	0,368	0,286	0,491	0,409	0,409	0,286	0,491	0,409	0,368	0,268	0,532	0,450	0,368	0,327
	Y	0,450	0,350	0,300	0,250	0,450	0,450	0,350	0,250	0,500	0,450	0,400	0,300	0,550	0,450	0,400	0,300	0,550	0,450	0,450	0,350	0,600	0,500	0,500	0,350	0,600	0,500	0,450	0,350	0,650	0,550	0,450	0,400
125	L	1,167	0,631	0,524	0,503	1,425	0,947	0,607	0,531	1,578	1,264	0,644	0,527	1,664	1,286	0,805	0,658	1,801	1,629	1,019	0,644	1,991	1,494	1,494	0,712	1,885	1,637	1,234	0,780	2,004	1,680	1,224	0,755
	X	0,378	0,378	0,297	0,215	0,419	0,378	0,337	0,256	0,460	0,378	0,378	0,297	0,501	0,419	0,378	0,297	0,542	0,419	0,378	0,337	0,542	0,460	0,460	0,337	0,583	0,460	0,378	0,337	0,624	0,501	0,419	0,378
	Y	0,462	0,462	0,362	0,262	0,513	0,462	0,412	0,312	0,563	0,462	0,462	0,362	0,613	0,513	0,462	0,362	0,663	0,513	0,462	0,412	0,663	0,563	0,563	0,412	0,713	0,563	0,462	0,412	0,763	0,613	0,513	0,462
150	L	1,204	0,862	0,706	0,472	1,631	1,293	0,659	0,532	1,840	1,412	0,879	0,708	1,972	1,471	1,099	0,689	2,166	1,577	1,392	0,699	2,095	1,743	1,743	0,773	2,294	1,909	1,379	0,847	2,465	1,993	1,400	1,031
	X	0,429	0,389	0,307	0,266	0,470	0,389	0,389	0,307	0,511	0,429	0,389	0,307	0,552	0,470	0,389	0,348	0,593	0,511	0,389	0,389	0,634	0,511	0,511	0,389	0,634	0,511	0,429	0,389	0,675	0,552	0,470	0,389
	Y	0,525	0,475	0,375	0,325	0,575	0,475	0,475	0,375	0,625	0,525	0,475	0,375	0,675	0,575	0,475	0,426	0,725	0,625	0,475	0,475	0,775	0,625	0,625	0,475	0,775	0,625	0,525	0,475	0,825	0,675	0,575	0,475

THRUST BLOCK DETAILS
NTS

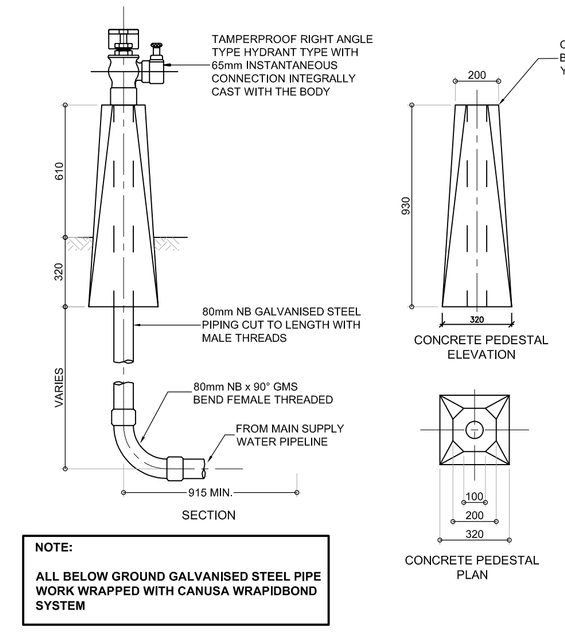


TYPICAL SECTION THROUGH POND
PERIMETER PROTECTION
SCALE 1:10

NOTE:
LEVEL OF THE OVERFLOW CHANNEL
TO BE DETERMINED ON SITE



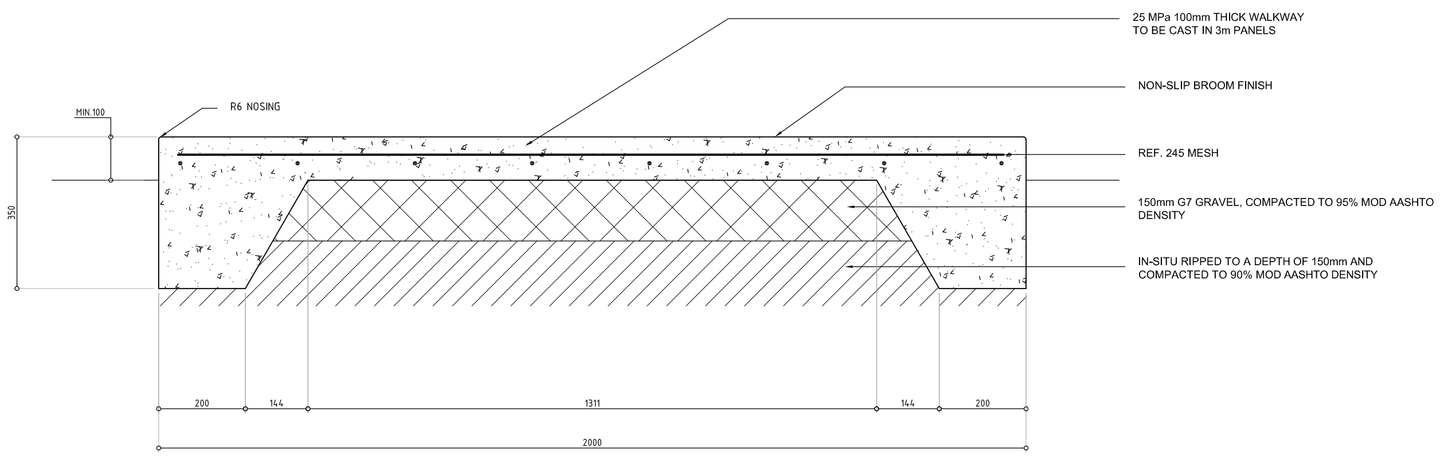
TYPICAL SECTION THROUGH
SLUDGE DAM SEPERATION WALL
SCALE 1:50



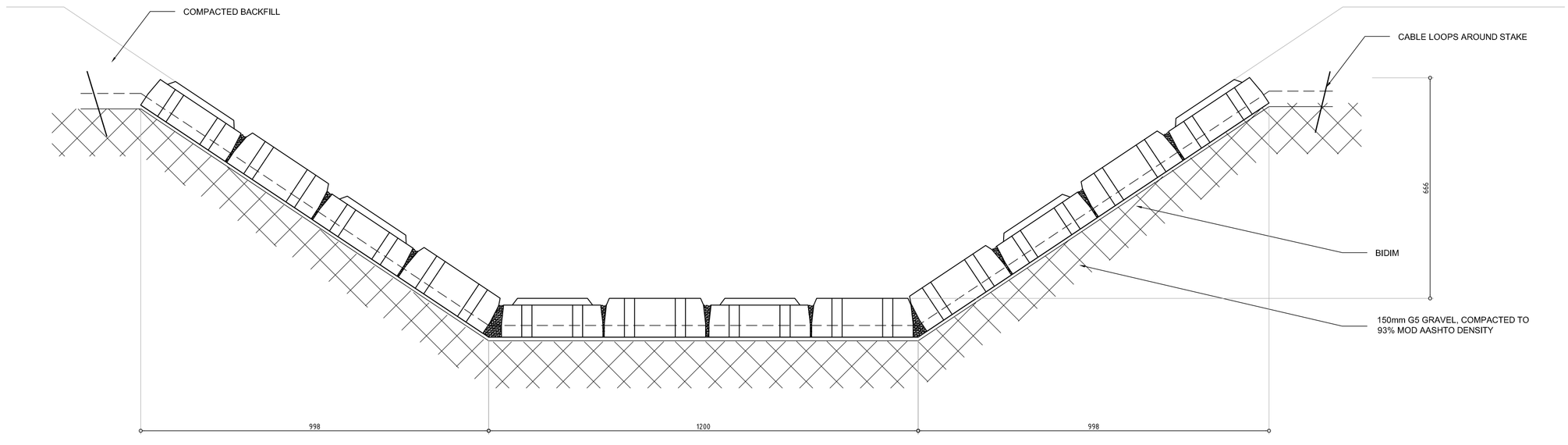
NOTE:

ALL BELOW GROUND GALVANISED STEEL PIPE WORK WRAPPED WITH CANUSA WRAPIDBOND SYSTEM

EXTERNAL MOUNTED TAMPERPROOF
FIRE HYDRANT DETAIL
Scale 1: 10



TYPICAL CONCRETE WALKWAY SECTION
SCALE 1:10



TYPICAL SECTION THROUGH
STORMWATER CHANNEL/CUT OFF DRAIN
SCALE 1:10

NR.	DATE	REVISIONS
0	2021/05/05	FOR TENDER
1	2023/09/07	DOCUMENTATION

DRAWN: PK
DATE: 2021-05-05
CHECKED: JPCvW
SCALE: AS SHOWN

ARCHITECT

CLIENT: health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT: *TAFALOFEFE HOSPITAL: WATER AND WASTEWATER TREATMENT*

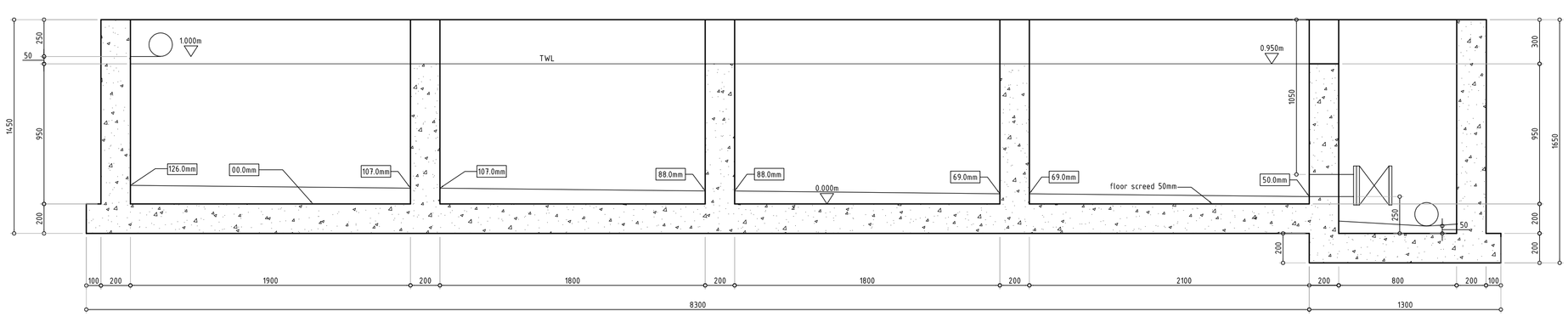
DRAWING: *GENERAL DETAILS*

CIVIL STRUCTURAL ENGINEERS

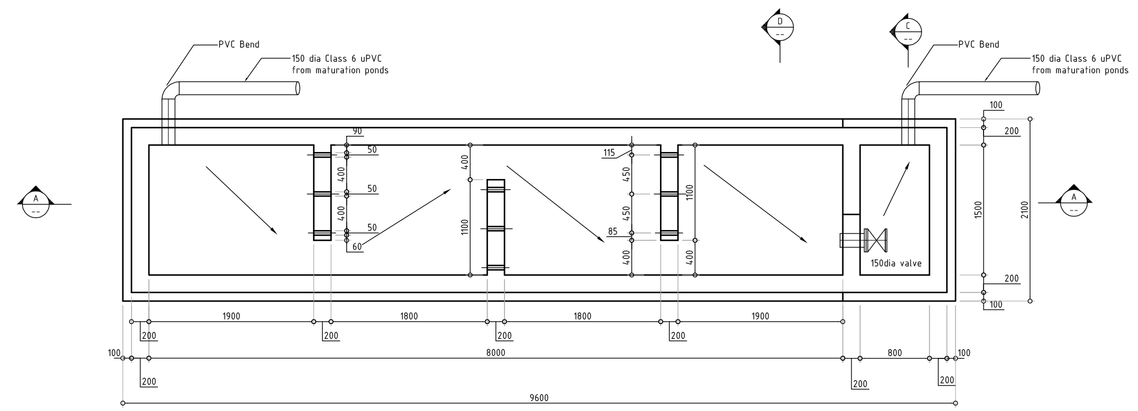
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Drawing Size: A1
DWG NO.: *106*
REV: *1*

B-339

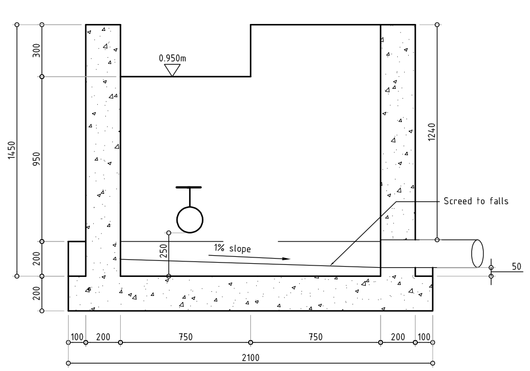
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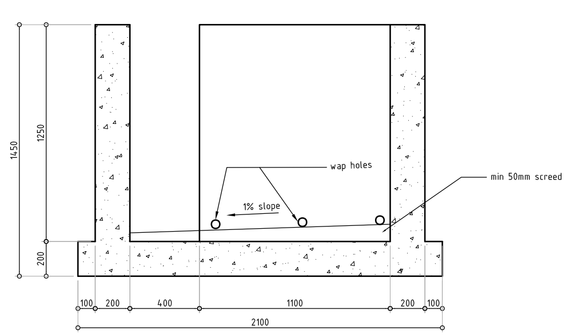
CHLORINE CONTACT CHANNEL
SECTION A-A
SCALE 1:25



CHLORINE CONTACT CHANNEL
PLAN
SCALE 1:50



SECTION C-C
SCALE 1:25



SECTION D-D
SCALE 1:25

NOTES

NR.	DATE	REVISIONS
0	2021/05/07	FOR INFORMATION

DRAWN PK	CHECKED JPCvW
DATE 2021-05-05	SCALE AS SHOWN

CSE CONSULTING (Pty) Ltd
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Bloemfontein
T : 082 373 1391
E : bfn@cse-consult.co.za
CIVIL STRUCTURAL ENGINEERS

ARCHITECT

CLIENT

health
Department:
Health
REPUBLIC OF SOUTH AFRICA

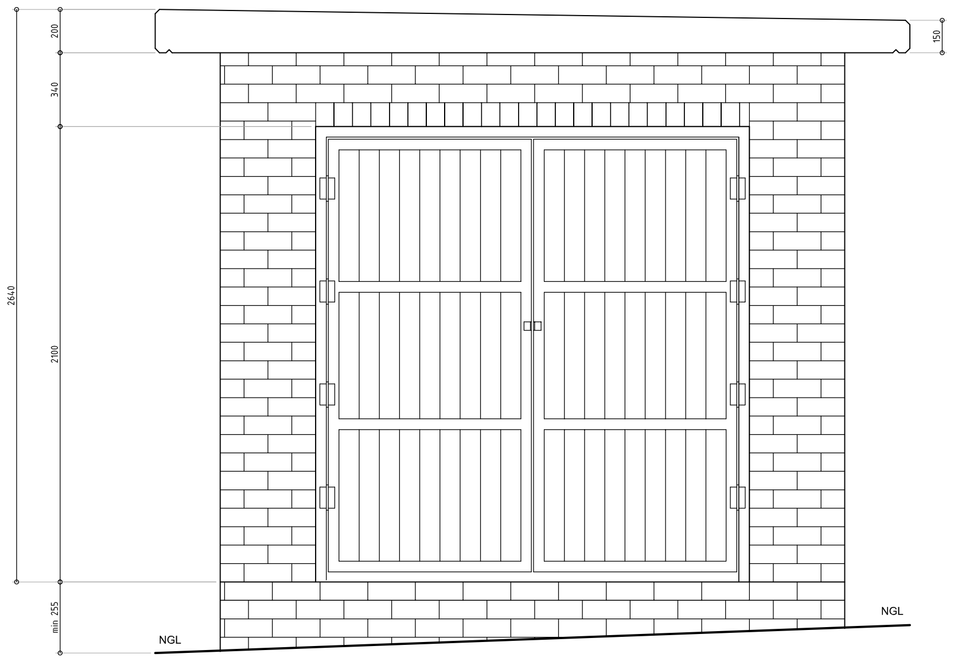
PROJECT
TAFALOFEFE HOSPITAL:WATER AND WASTEWATER TREATMENT

DRAWING
CHLORINE CONTACT CHANNEL

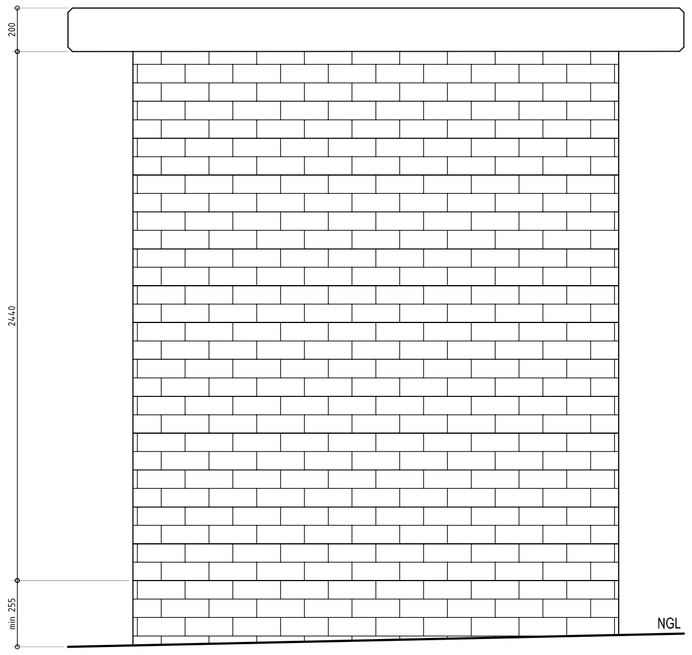
PROJECT NO	
E765	
DWG NO. *107*	REV *0*

B-340

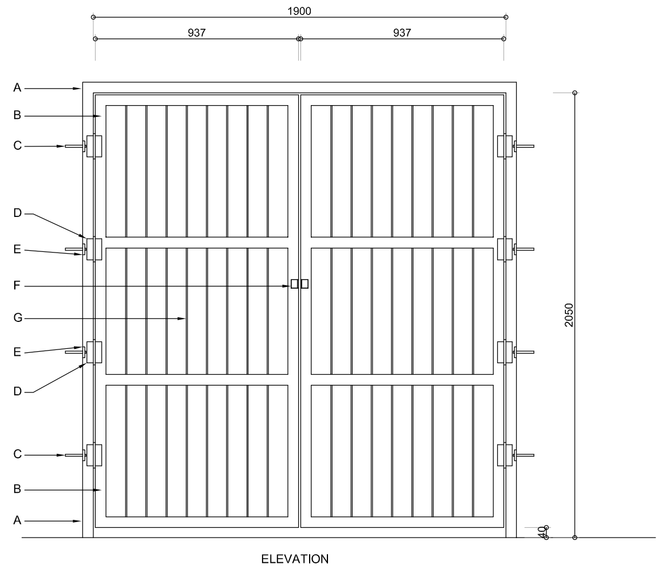
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ELEVATION A
Scale 1:20



ELEVATION B
Scale 1:20

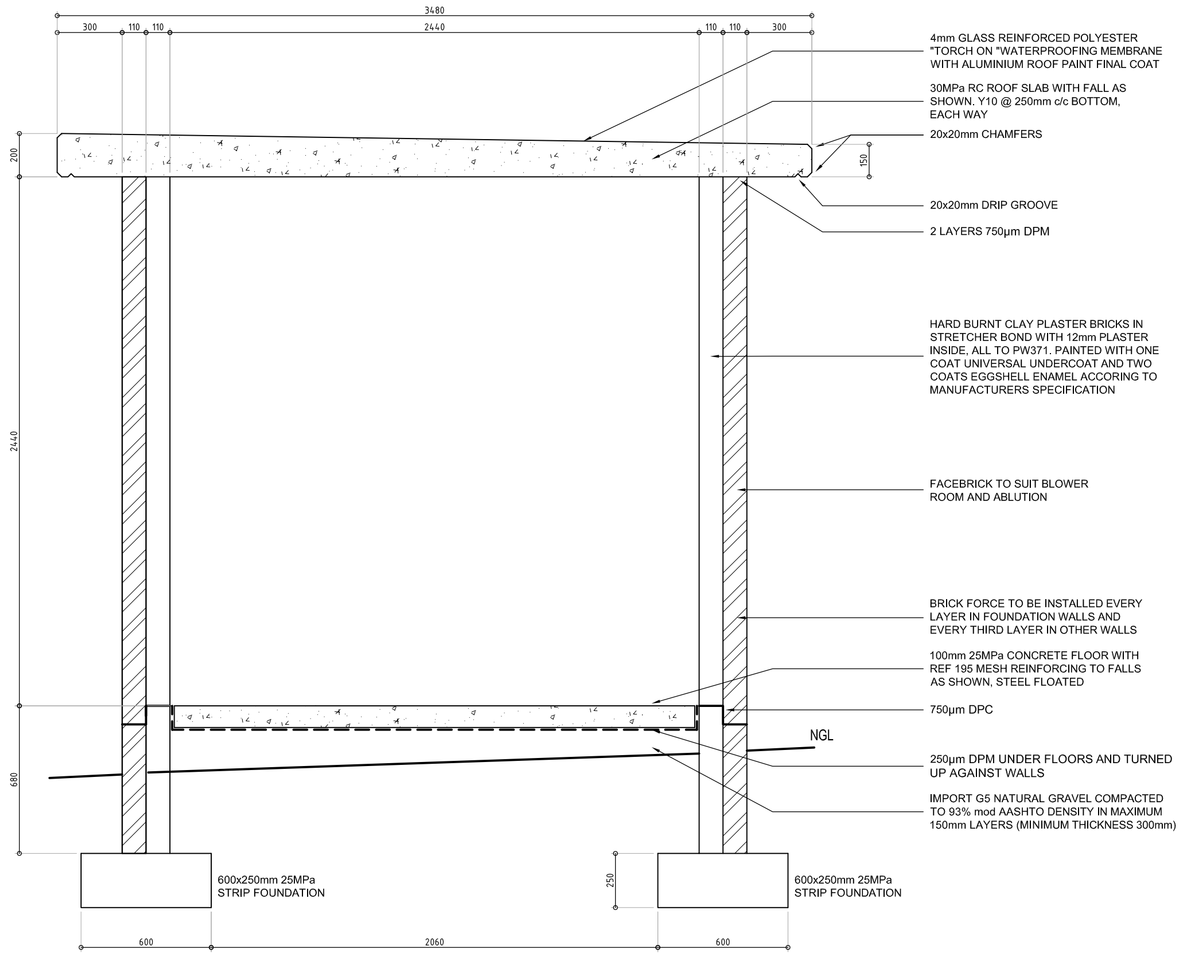


ELEVATION

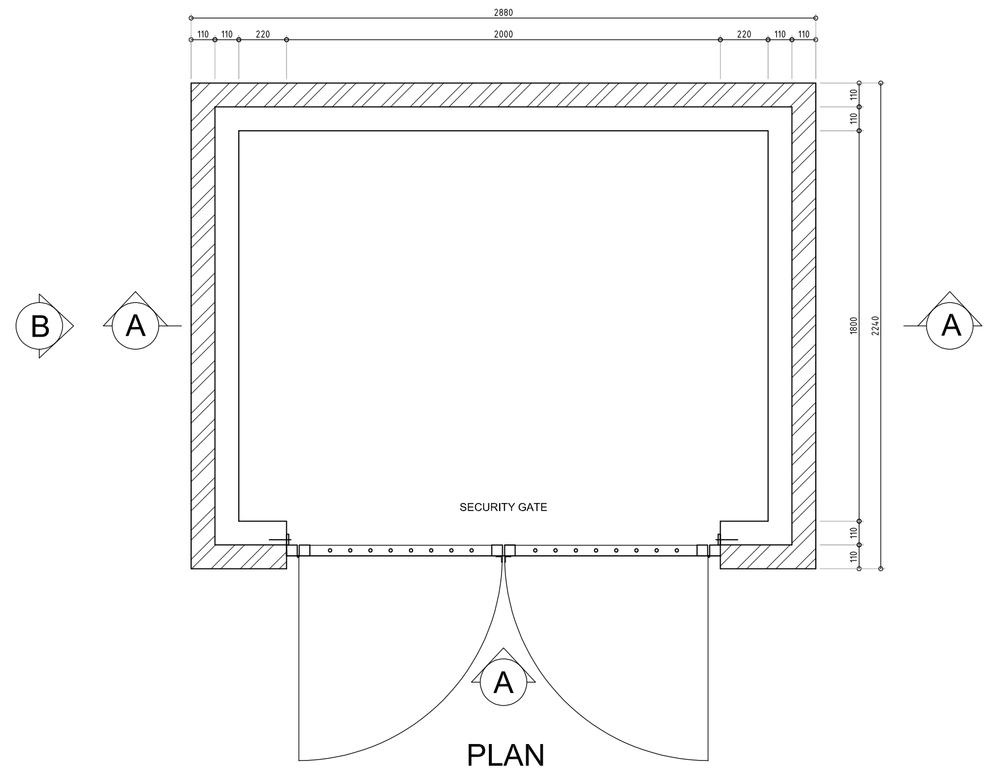
SECURITY GATE
N.T.S.

SECURITY GATE : LEGEND

A - 50 x 50 x 3,5 mm SHS TO FORM FRAME
B - 50 x 50 x 3.5mm SHS TO FORM GATE
C - 12 No. M10 EXPANSION BOLTS 80 mm INTO BRICKWORK
D - 8 No. 16 dia x 100 mm WELDABLE BULLET HINGES
E - 12 No. 50x75x10mm LUGS
F - 2 No. x 50 x 50 x 10 mm LUGS WITH 10 dia HOLE WITH 70 dia DISCUS PADLOCK
G - 16 mm dia STEEL BARS AT 100mm c/c



SECTION A-A
Scale 1:20



PLAN
Scale 1:20

B-341

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NR.	DATE	REVISIONS
0	2021/05/05	FOR INFORMATION

DRAWN: P.KOCH
DATE: 2021-05-05
CHECKED: JPCvW
SCALE: AS SHOWN

ARCHITECT

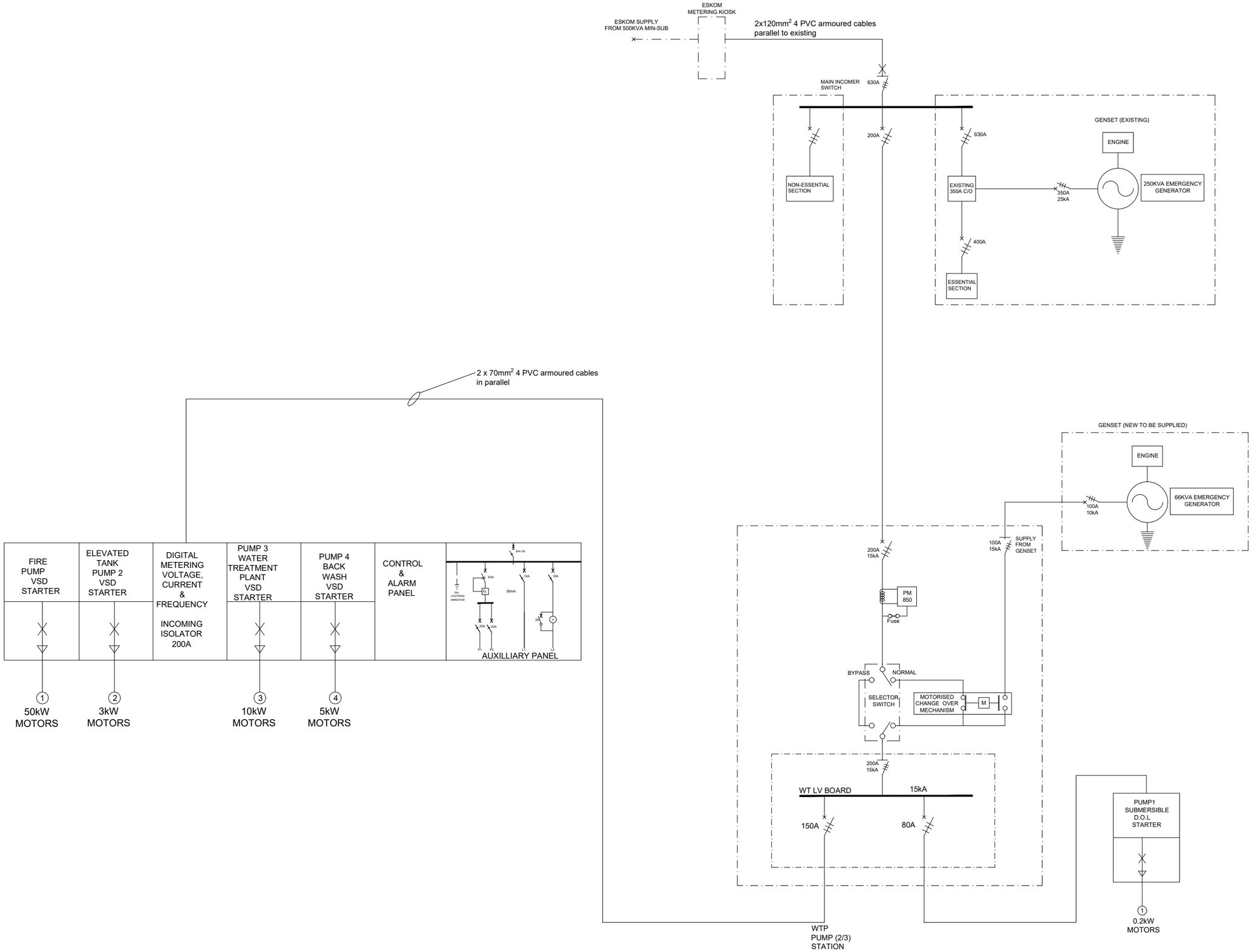
CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL:WATER AND WASTEWATER TREATMENT

DRAWING
CHLORINE BUILDING

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Bloemfontein
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CIVIL STRUCTURAL ENGINEERS

PROJECT NO: *E765*
DWG NO.: *108*
REV: *0*



NOTES

REVISIONS:

No:	Date:	By:	Description:

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SOUTHERNWOOD
EAST LONDON
TEL: 043 - 743 8266
E-MAIL: el@carifro.com

PROJECT TITLE:
TAFALOFEFE HOSPITAL
WATER AND WASTEWATER WORKS

SCMU NUMBER: **SCMU5-24/25-0037**

DISCIPLINE: **ELECTRICAL**

DRAWING TITLE:
ELECTRICAL SCHEMATIC DIAGRAM

DRAWN BY:	CHECKED BY:	APPROVED:
LM	LM	LN

SCALE: NTS

COPYRIGHT RESERVED

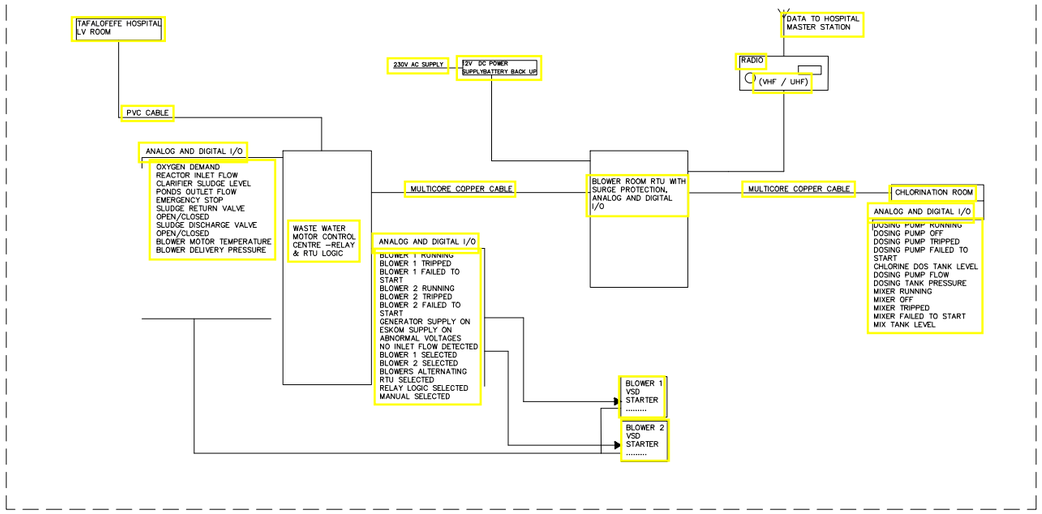
DATE: 24/01/2024

DRAWING FILE NAME: **SCHEMATIC DIAGRAM** REV: **00**

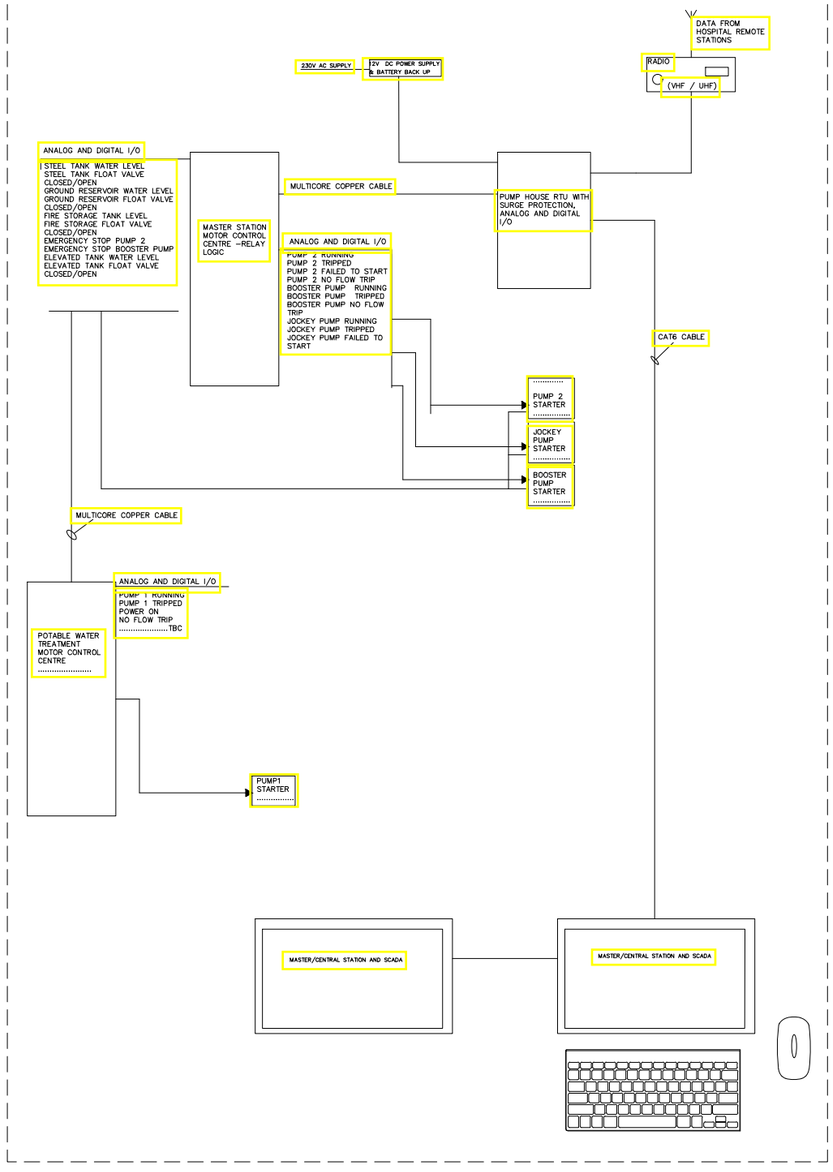
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PROJECT STATUS: **TENDER**

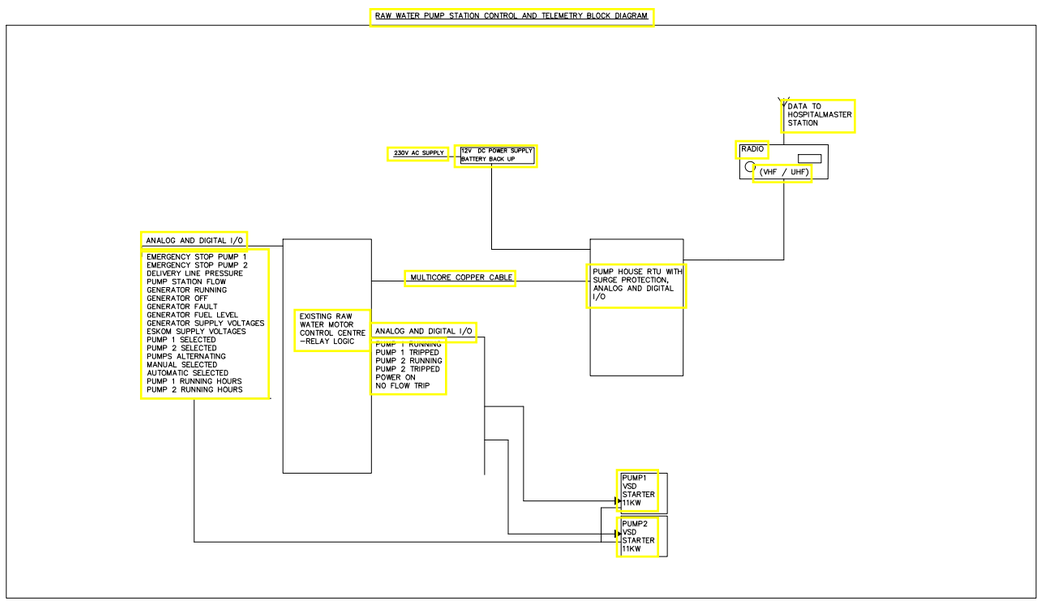
WASTER WATER TREATMENT WORKS CONTROL AND TELEMETRY BLOCK DIAGRAM(BLOWERS)



MASTER STATION CONTROL AND TELEMETRY BLOCK DIAGRAM



RAW WATER PUMP STATION CONTROL AND TELEMETRY BLOCK DIAGRAM



NOTES

No:	Date:	By:	Description:

REVISIONS:

CARIFRO
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GREEN BUILDING CONSULTANTS

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TEL: 043 - 743 8266
E-MAIL: el@carifro.com

PROJECT TITLE:
TAFALOFEFE WATER AND WASTE WATER COMPLETION PROJECT.

SCMU NUMBER: **SCMU5-24/25-0037**

DISCIPLINE: **ELECTRICAL**

DRAWING TITLE:
CONTROL TELEMETRY AND SCADA BLOCK DIAGRAM.

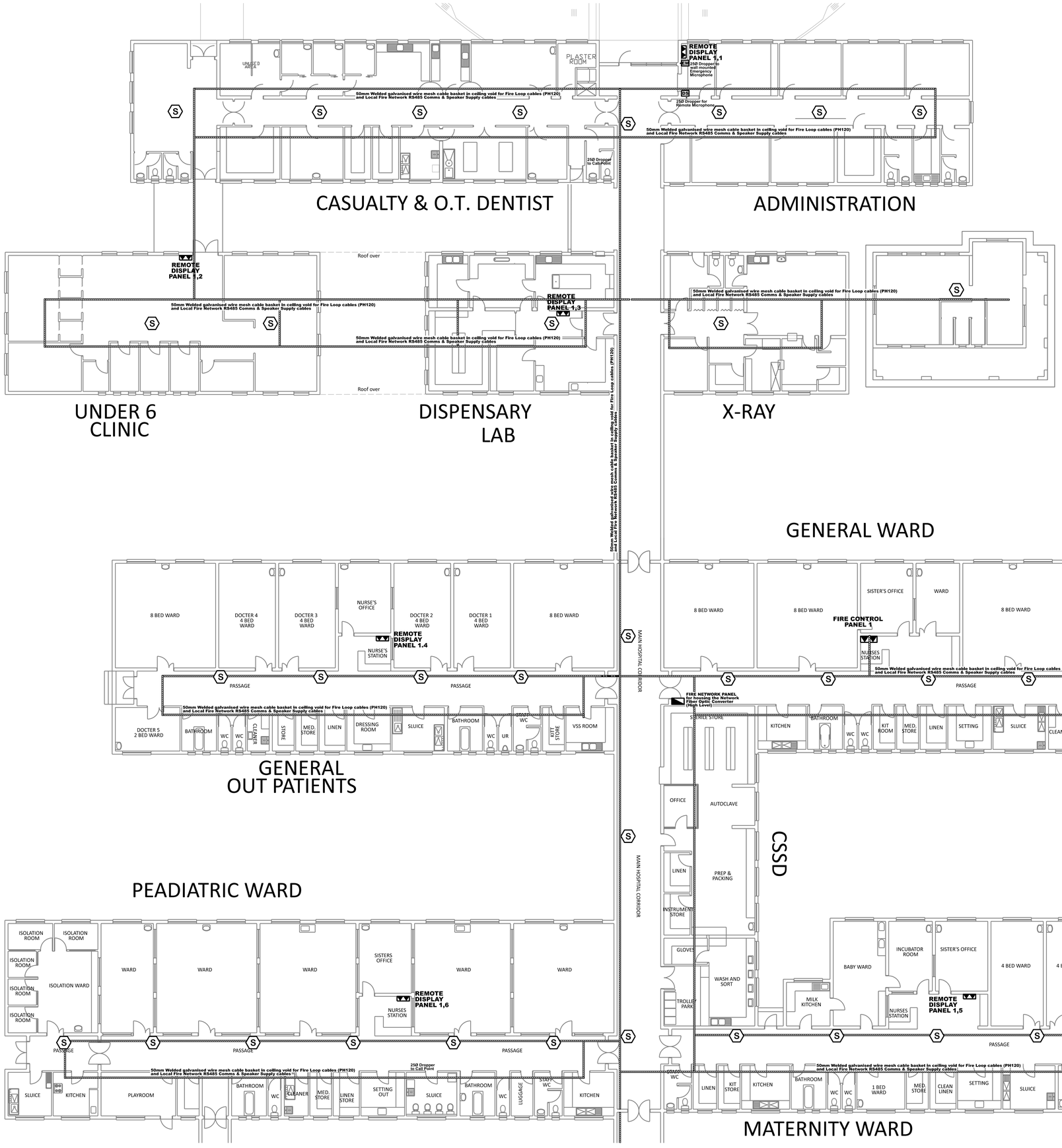
DRAWN BY:	CHECKED BY:	APPROVED:
LM	LM	LN
SCALE: NTS	COPYRIGHT RESERVED	DATE: 24/01/2024

DRAWING FILE NAME: **BLOCK DIAGRAM** REV: **00**

SHEET NO: **CAR18-1807E-001** REV: **00**

PROJECT STATUS: **TENDER**

VERSION 1.01

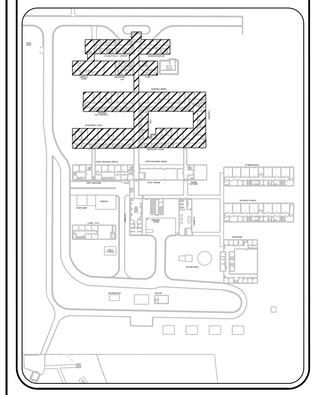


LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- (M) ADDRESSABLE MULTISENSOR
- (MS) ADDRESSABLE MULTISENSOR C/W SOUNDER BASE
- (HS) ADDRESSABLE HORN SOUNDER
- (VA) ADDRESSABLE LIGHT BEACON
- (I) ADDRESSABLE INTERFACE UNIT
- (R) ADDRESSABLE RELAY UNIT
- EVACUATION SIREN (at high level)
- (S) EVACUATION CEILING MOUNT SPEAKER WITH FIRE DOME
- (DS) REMOTE MICROPHONE DESK TOP BASE STATION
- (EM) WALL MOUNTED EMERGENCY MICROPHONE
- 50mm WELDED GALVANISED WIRE MESH CABLE BASKET

NOTES

1) Do not scale from this drawing. Check all given dimensions and site dimensions and/or levels prior to any pricing, manufacture or construction of any item.
2) The copyright for the design and information on this drawing is vested and may not be copied or reproduced without the written authority of the Engineer
3) All conduit and conduit accessories shall bear the SANS mark.Conduit is to be chased into brick and run in inaccessible roof or floor voids. Galvanised trunking wire-ways and/or wiring baskets are to be to run on the surface of roof/floor slabs and walls. No PVC saddles or fixing/ mounting clamps may be used.
4) All detector bases shall be fixed to thin wall galvanised round conduit box. Where detector bases are used on movable/ fixed ceiling tiles the box will be connected with a length of flexible conduit to a conduit box and/or wire-ways/ wiring baskets fixed to the slab soffit.
5) The fire alarm Installation shall be wired as a 2 wire looped system with spurs only within zones, so that it will be possible to access a zone from either end. The fire cable shall have a 2 hour fire rating(PH120) .
6) All systems controlled/ switched by the fire alarm installation that are not wired in a fail-safe configuration (open circuit in alarm condition) shall have a fire rating of no less than 1/2 hour.
7) Fire alarm panel and siren to be supplied from a clearly labelled dedicated circuit on the electrical distribution board



NR.	DATE	REVISIONS

DRAWN	CHECKED
DFB	DFB
DATE: 2023/08/11	SCALE: 1 : 100

CSE CONSULTING (Pty) Ltd
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Mechanical Engineers
CARIFRO - ELECTRICAL & MECHANICAL CONSULTING ENGINEERS
4-6 Belgravia Road
Belgravia, East London, 5213
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Email: el@carifro.com

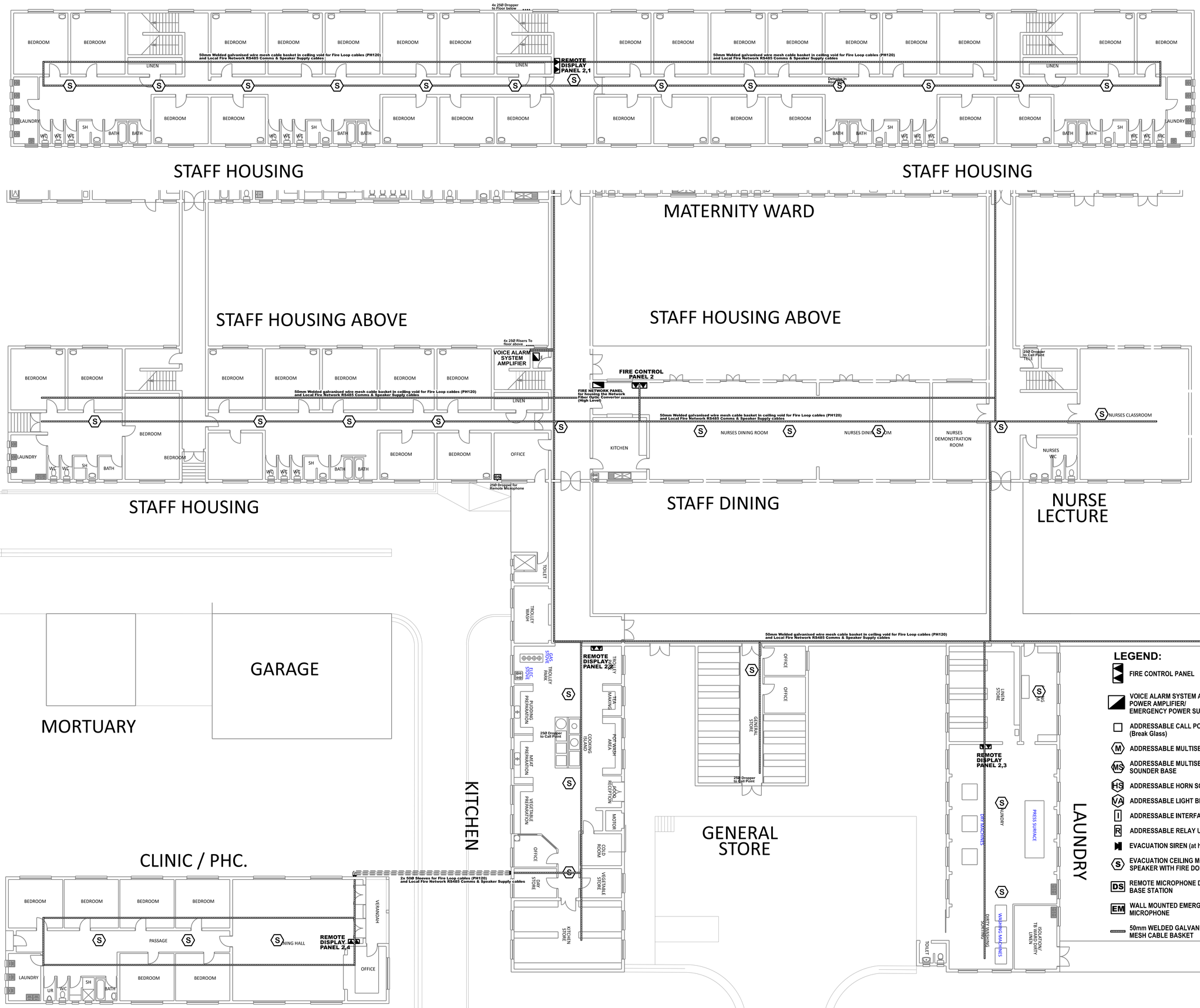
CLIENT
health
Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

TAFALOFEFE HOSPITAL: EVACUATION SYSTEM CASUALTY, X-RAY GENERAL & MATERNITY WARDS FLOOR PLAN

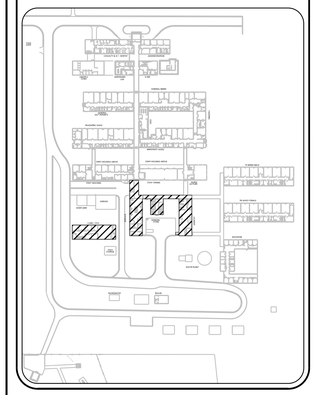
PROJECT NO: *1807 FIRE DETECTION*

DWG NO.: *1807-FD05* | REV: *0*



NOTES

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6) All systems controlled/ switched by the fire alarm installation that are not wired in a fail-safe configuration (open circuit in alarm condition) shall have a fire rating of no less than 1/2 hour.
7) Fire alarm panel and siren to be supplied from a clearly labelled dedicated circuit on the electrical distribution board



NR.	DATE	REVISIONS

DRAWN	CHECKED
DFB	DFB
DATE	SCALE
2023/08/11	1 : 100

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CIVIL STRUCTURAL ENGINEERS

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CLIENT
health
Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

TAFALOFEFE HOSPITAL: EVACUATION SYSTEM STAFF HOUSING, DINING KITCHEN, STORES, LAUNDRY & CLINIC/PHC FLOOR PLAN

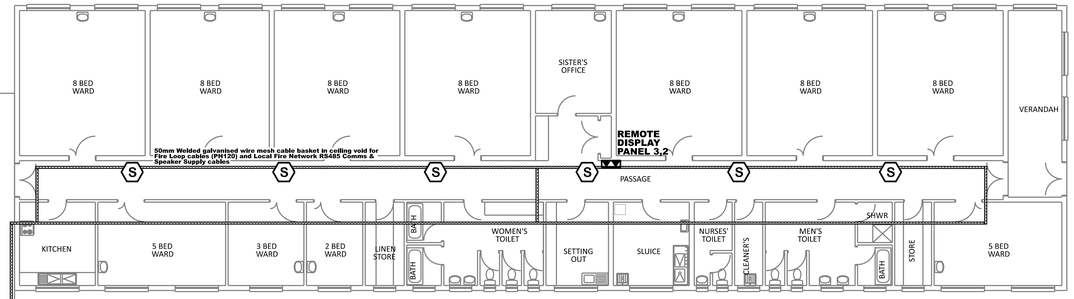
PROJECT NO
1807 FIRE DETECTION

DWG NO.	REV
1807-FD06	*0*

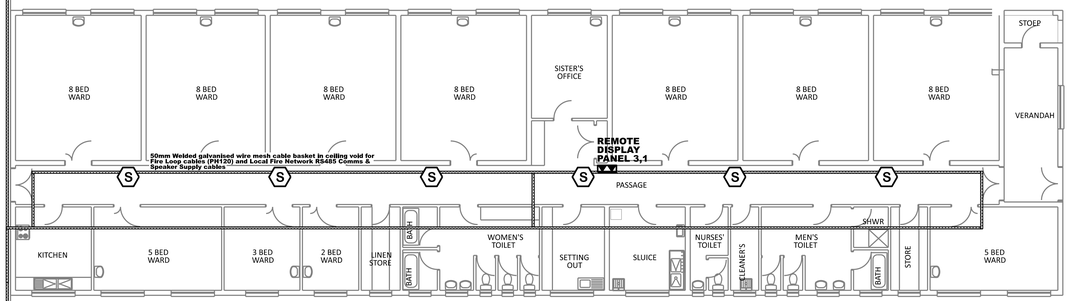
LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- M — ADDRESSABLE MULTISENSOR
- MS — ADDRESSABLE MULTISENSOR C/W SOUNDER BASE
- HS — ADDRESSABLE HORN SOUNDER
- VA — ADDRESSABLE LIGHT BEACON
- I — ADDRESSABLE INTERFACE UNIT
- R — ADDRESSABLE RELAY UNIT
- EVACUATION SIREN (at high level)
- S — EVACUATION CEILING MOUNT SPEAKER WITH FIRE DOME
- DS — REMOTE MICROPHONE DESK TOP BASE STATION
- EM — WALL MOUNTED EMERGENCY MICROPHONE
- 50mm WELDED GALVANISED WIRE MESH CABLE BASKET

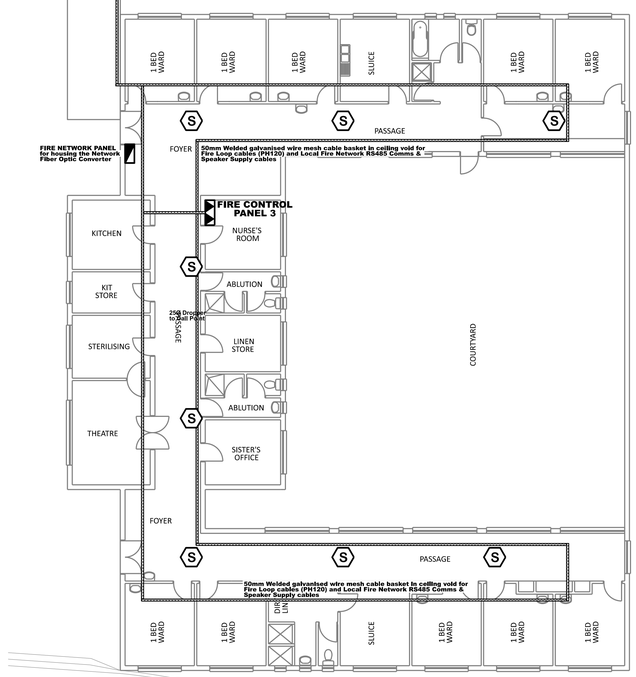
TB WARD MALE



TB WARD FEMALE



ISOLATION

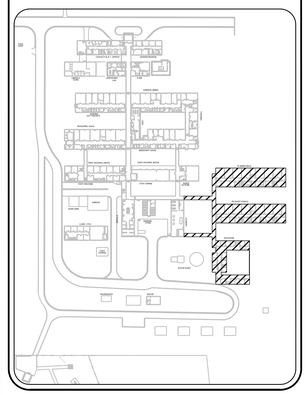


LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- M — ADDRESSABLE MULTISENSOR
- MS — ADDRESSABLE MULTISENSOR C/W SOUNDER BASE
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7) Fire alarm panel and siren to be supplied from a clearly labelled dedicated circuit on the electrical distribution board



NR.	DATE	REVISIONS

DRAWN	CHECKED
DFB	DFB
DATE: 2023/08/11	SCALE: 1 : 100

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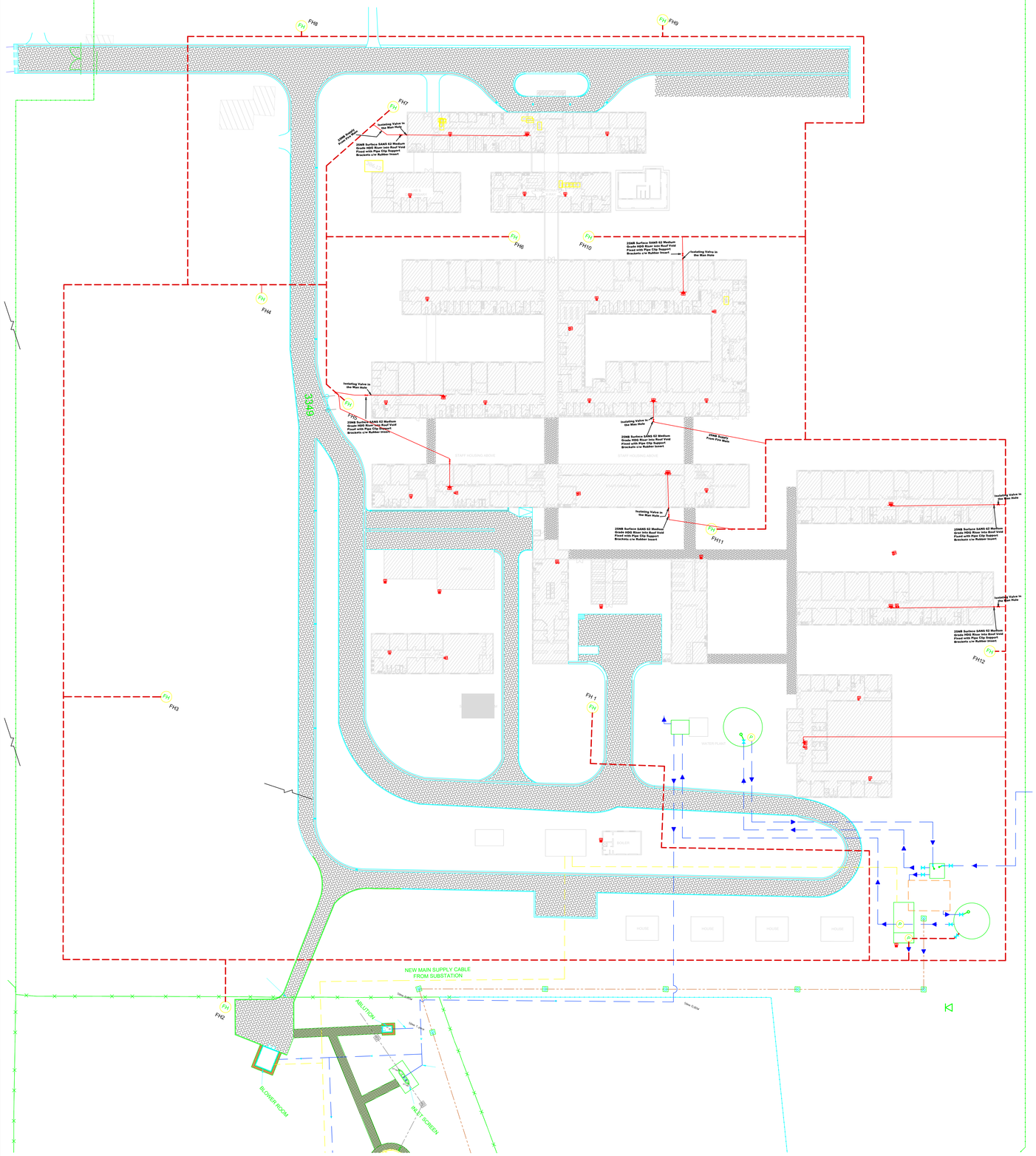
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Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

DRAWING
TAFALOFEFE HOSPITAL: EVACUATION SYSTEM ISOLATION & TB WARDS FLOOR PLAN

PROJECT NO
1807 FIRE DETECTION

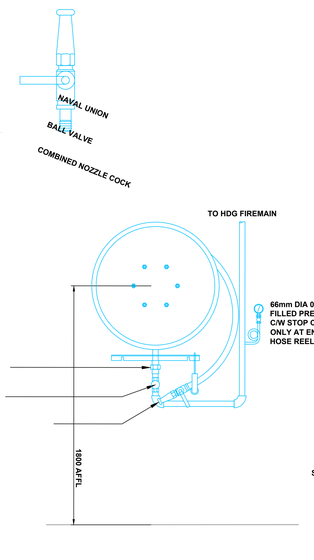
DWG NO.	REV
1807-FD07	*0*

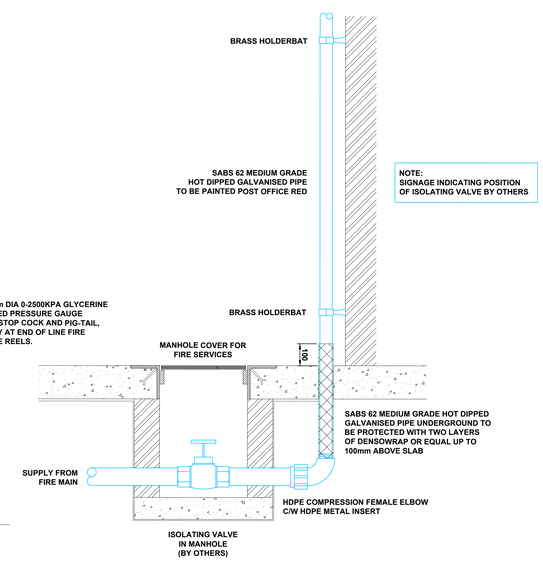


LEGEND:

- PORTABLE 4.5KG DCP FIRE EXTINGUISHER TO BE WALL OR COLUMN MOUNTED ON TIMBER BACKING BOARD (BOARD PAINTED POST OFFICE RED)
- PORTABLE 5KG CO2 FIRE EXTINGUISHER TO BE WALL OR COLUMN MOUNTED ON TIMBER BACKING BOARD (BOARD PAINTED POST OFFICE RED)
- PORTABLE 9KG DCP FIRE EXTINGUISHER TO BE WALL OR COLUMN MOUNTED ON TIMBER BACKING BOARD (BOARD PAINTED POST OFFICE RED)
- P — PORTABLE 4.5KG DCP FIRE EXTINGUISHER TO BE WALL OR COLUMN MOUNTED INSIDE WEATHER PROOF UV RESISTANT CLEAR FIBREGLASS OR POLY CARBONATE CLEAR ENCLOSURE
- P — PORTABLE 9KG DCP FIRE EXTINGUISHER TO BE WALL OR COLUMN MOUNTED INSIDE WEATHER PROOF UV RESISTANT CLEAR FIBREGLASS OR POLY CARBONATE CLEAR ENCLOSURE
- FH — FIRE HOSE REEL C/W 30m HOSE AND NOZZLE. FIRE HOSE REEL TO BE WALL OR COLUMN MOUNTED INSIDE WEATHER PROOF UV RESISTANT CLEAR FIBREGLASS OR POLY CARBONATE CLEAR ENCLOSURE
- H — FIRE HOSE REEL 190x190mm PHOTOLUMINESCENT SIGNAGE TO BE WALL OR COLUMN MOUNTED
- E — FIRE EXTINGUISHER 190x190mm PHOTOLUMINESCENT SIGNAGE TO BE WALL OR COLUMN MOUNTED
- A — DIRECTIONAL ARROW 190x190mm PHOTOLUMINESCENT SIGNAGE TO BE WALL OR COLUMN MOUNTED INDICATING LOCATION OF FIRE EQUIPMENT

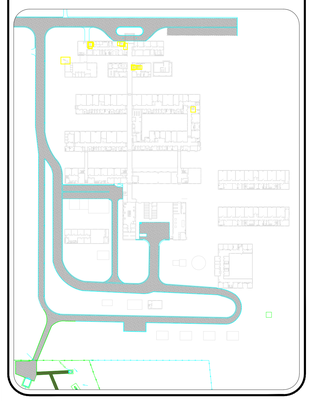
NOTE:
1) ALL ABOVE GROUND PIPEWORK TO SANS 062 MEDIUM GRADE HOT DIP GALVANISED PAINTED POST OFFICE RED. SCREWED JOINTS UP TO 50NB GROOVED COUPLINGS ABOVE 50NB
2) ALL UNDERGROUND PIPEWORK UPVC CLASS 2





NOTE:
SIGNAGE INDICATING POSITION OF ISOLATING VALVE BY OTHERS

NOTES



NR.	DATE	REVISIONS

DRAWN	CHECKED
JT	PG
DATE	**SCALE**
AUGUST-2023	1 : 400

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Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

DRAWING
TAFALOFEFE HOSPITAL: FIRE EQUIPMENT FLOOR PLAN

PROJECT NO
1807 FIRE PROTECTION

DWG NO.	REV
CAR-1807M-FE-01	0

Fire Network Panel	Length (metre)		
GENERAL WARD (Fire Control Panel 1)		60	175
STAFF DINING (Fire Control Panel 2)	60		115
ISOLATION (Fire Control Panel 3)	175	115	
	GENERAL WARD (Fire Control Panel 1)	STAFF DINING (Fire Control Panel 2)	ISOLATION (Fire Control Panel 3)

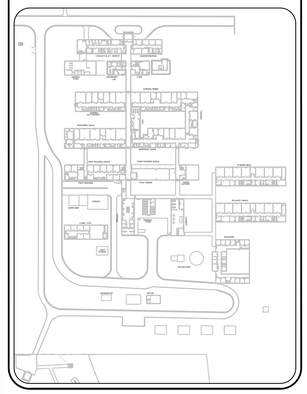
LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- (M) ADDRESSABLE MULTISENSOR
- (MS) ADDRESSABLE MULTISENSOR C/W SOUNDER BASE
- (HS) ADDRESSABLE HORN SOUNDER
- (VA) ADDRESSABLE LIGHT BEACON
- (I) ADDRESSABLE INTERFACE UNIT
- (R) ADDRESSABLE RELAY UNIT
- EVACUATION SIREN (at high level)
- (S) EVACUATION CEILING MOUNT SPEAKER WITH FIRE DOME
- (DS) REMOTE MICROPHONE DESK TOP BASE STATION
- (EM) WALL MOUNTED EMERGENCY MICROPHONE
- 50mm WELDED GALVANISED WIRE MESH CABLE BASKET

REMOTE DISPLAY PANEL 1.1
ADMINISTRATION
CASUALTY & O.T. DENTIST
REMOTE DISPLAY PANEL 1.3
X-RAY
REMOTE DISPLAY PANEL 1.2
DISPENSARY
LAB
UNDER 6 CLINIC
GENERAL WARD
THEATRES
FIRE CONTROL PANEL 1
FIRE NETWORK PANEL for housing the Network Fibre Optic Converter (High Level)
REMOTE DISPLAY PANEL 1.4
GENERAL OUT PATIENTS
CSSD
REMOTE DISPLAY PANEL 1.5
PEADIATRIC WARD
REMOTE DISPLAY PANEL 1.6
MATERNITY WARD
TB WARD MALE
REMOTE DISPLAY PANEL 3.2
TB WARD FEMALE
REMOTE DISPLAY PANEL 3.1
STAFF HOUSING ABOVE
VOICE ALARM SYSTEM AMPLIFIER
FIRE CONTROL PANEL 2
FIRE NETWORK PANEL for housing the Network Fibre Optic Converter (High Level)
4core Multimode HDD Fibre Optic cabel in 50mm Welded galvanised wire mesh cable basket in ceiling void
4core Multimode HDD Fibre Optic cabel in 50mm Welded galvanised wire mesh cable basket surface under ceiling/roof
NURSE LECTURE
STAFF DINING
REMOTE DISPLAY PANEL 2.3
LAUNDRY
REMOTE DISPLAY PANEL 2.2
STAFF HOUSING
GENERAL STORE
ISOLATION
FIRE CONTROL PANEL 3
FIRE NETWORK PANEL for housing the Network Fibre Optic Converter (High Level)
GARAGE
MORTUARY
KITCHEN
CLINIC / PHC.
REMOTE DISPLAY PANEL 2.4
WATER PLANT
STAFF CHANGE
BOILER
INCINERATOR

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7) Fire alarm panel and siren to be supplied from a clearly labelled dedicated circuit on the electrical distribution board



NR.	DATE	REVISIONS

DRAWN	CHECKED
DFB	DFB
DATE: 2023/08/11	SCALE: 1 : 250

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CESA · GREEN BUILDING COUNCIL · zaREDs

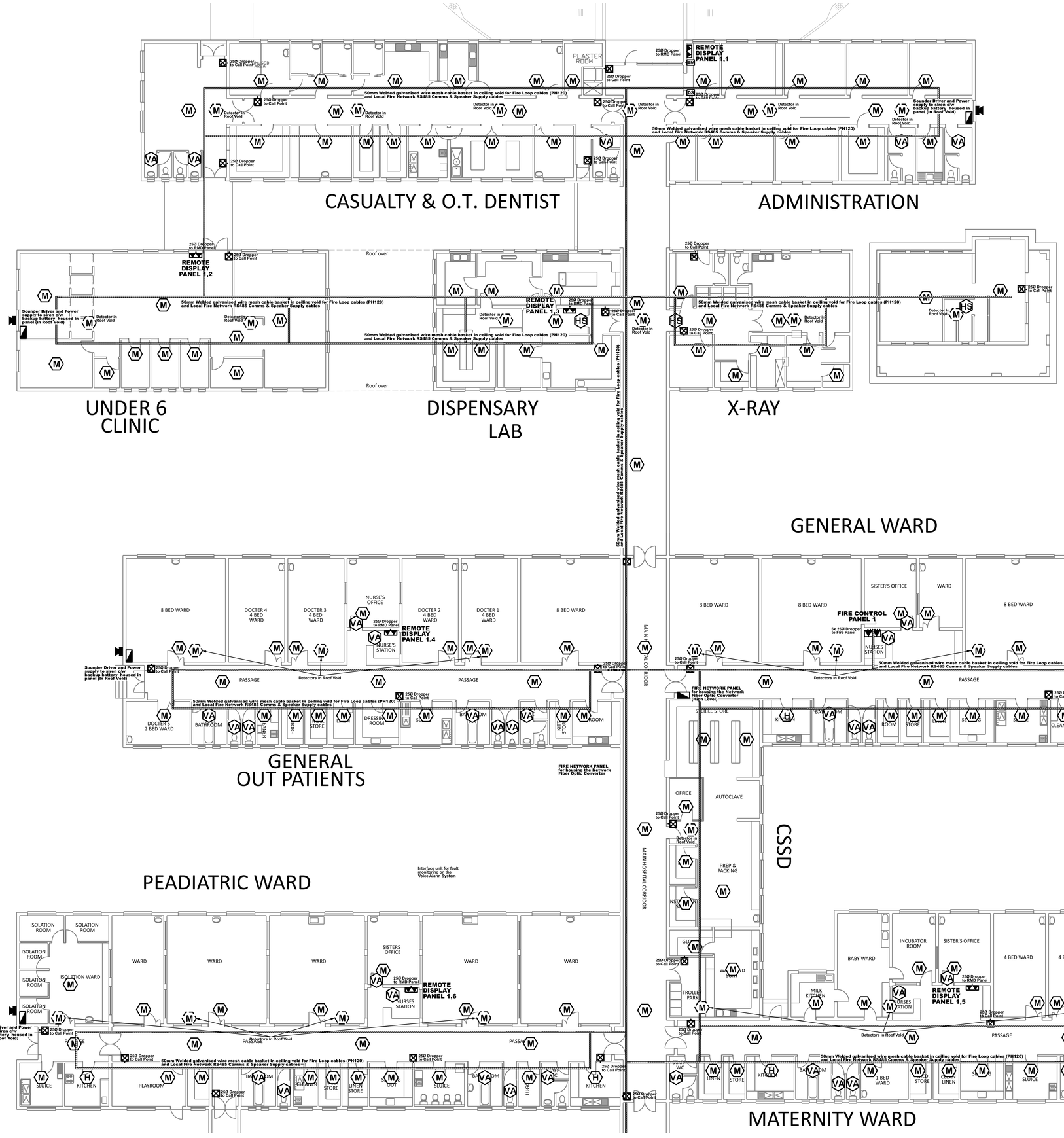
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Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

DRAWING
TAFALOFEFE HOSPITAL: FIRE DETECTION SITE PLAN

PROJECT NO
1807 FIRE DETECTION

DWG NO.	REV
1807-FD01	*0*

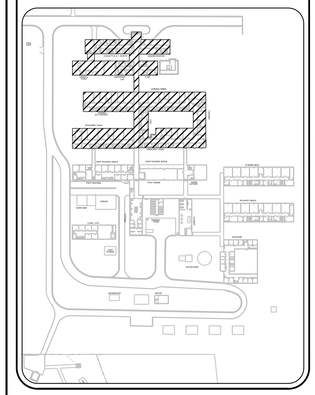


LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- M — ADDRESSABLE MULTISENSOR
- MS — ADDRESSABLE MULTISENSOR C/W SOUNDER BASE
- HS — ADDRESSABLE HORN SOUNDER
- VA — ADDRESSABLE LIGHT BEACON
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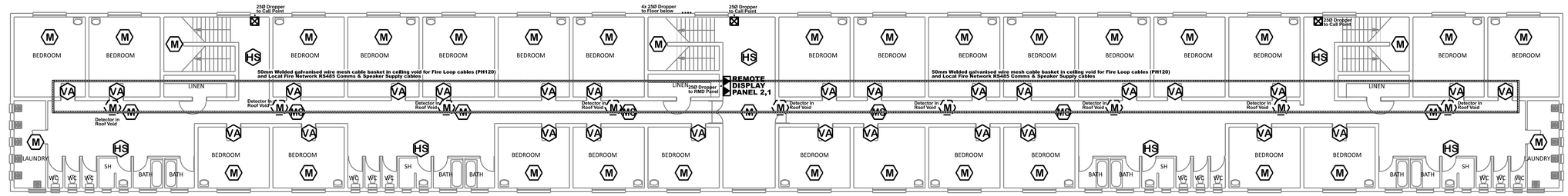
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Department: Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

TAFALOFEFE HOSPITAL: FIRE DETECTION CASUALTY, X-RAY GENERAL & MATERNITY WARDS FLOOR PLAN

PROJECT NO: *1807 FIRE DETECTION*

DWG NO.	REV
1807-FD02	*0*



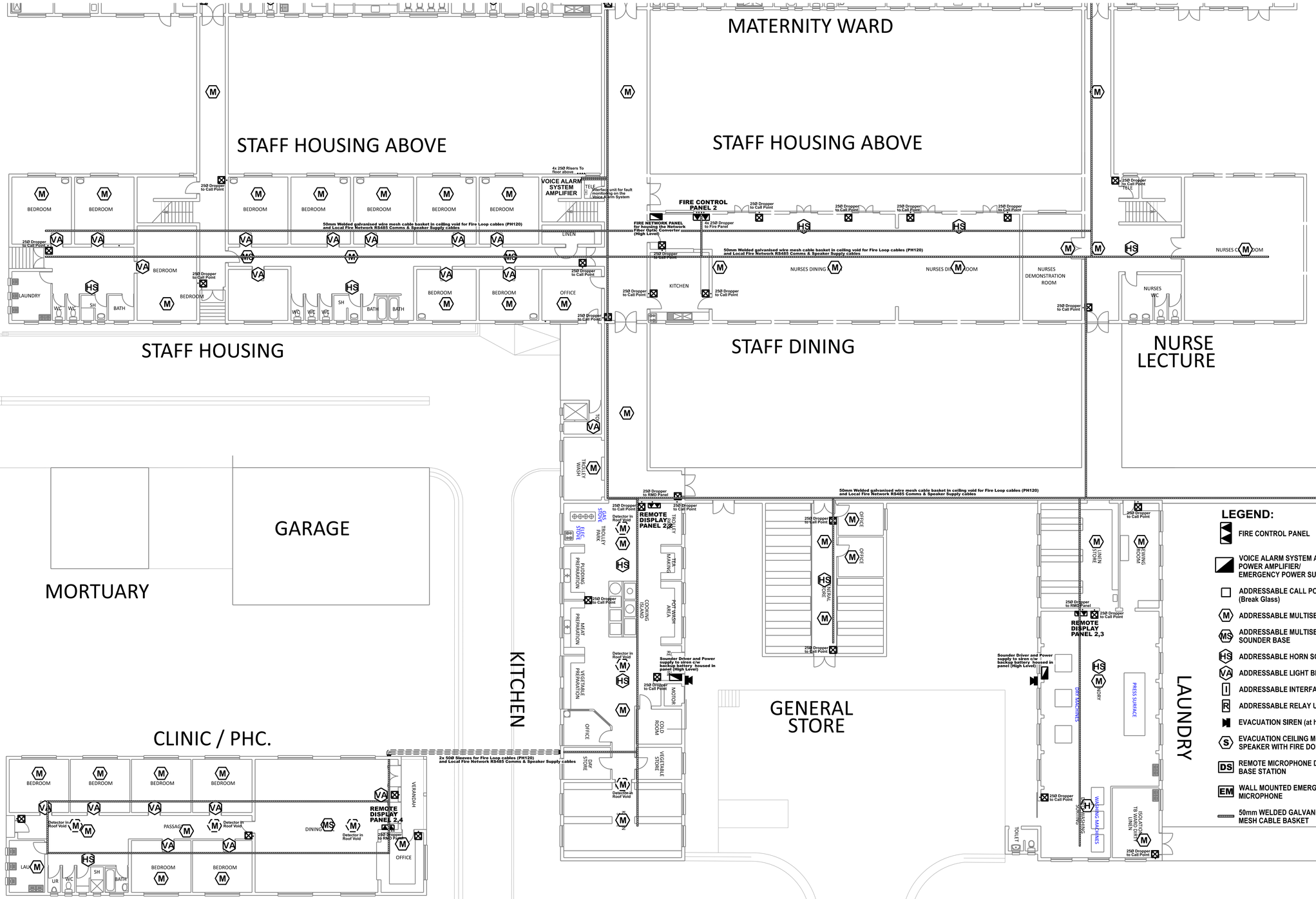
STAFF HOUSING

STAFF HOUSING

MATERNITY WARD

STAFF HOUSING ABOVE

STAFF HOUSING ABOVE



STAFF HOUSING

STAFF DINING

NURSE LECTURE

MORTUARY

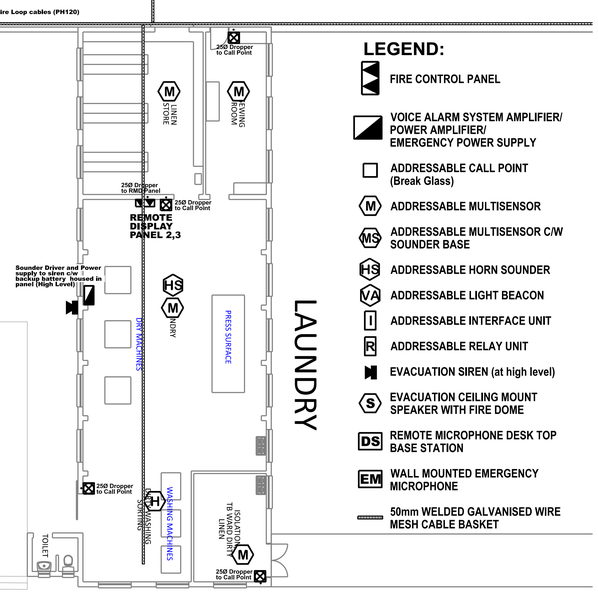
GARAGE

CLINIC / PHC.

2x 50Ø Sleeves for Fire Loop cables (PH120) and Local Fire Network RS485 Comms & Speaker Supply cables

KITCHEN

GENERAL STORE



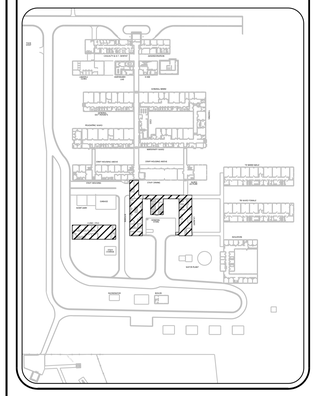
LAUNDRY

LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- M ADDRESSABLE MULTISENSOR
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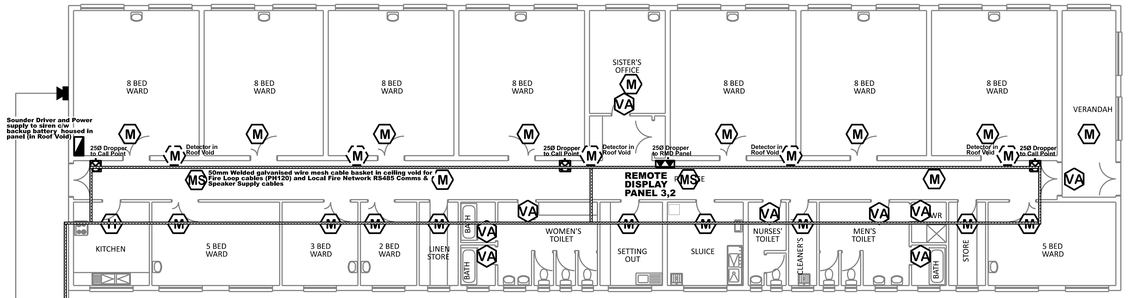
PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

TAFALOFEFE HOSPITAL: FIRE DETECTION STAFF HOUSING, DINING KITCHEN, STORES, LAUNDRY & CLINIC/PHC FLOOR PLAN

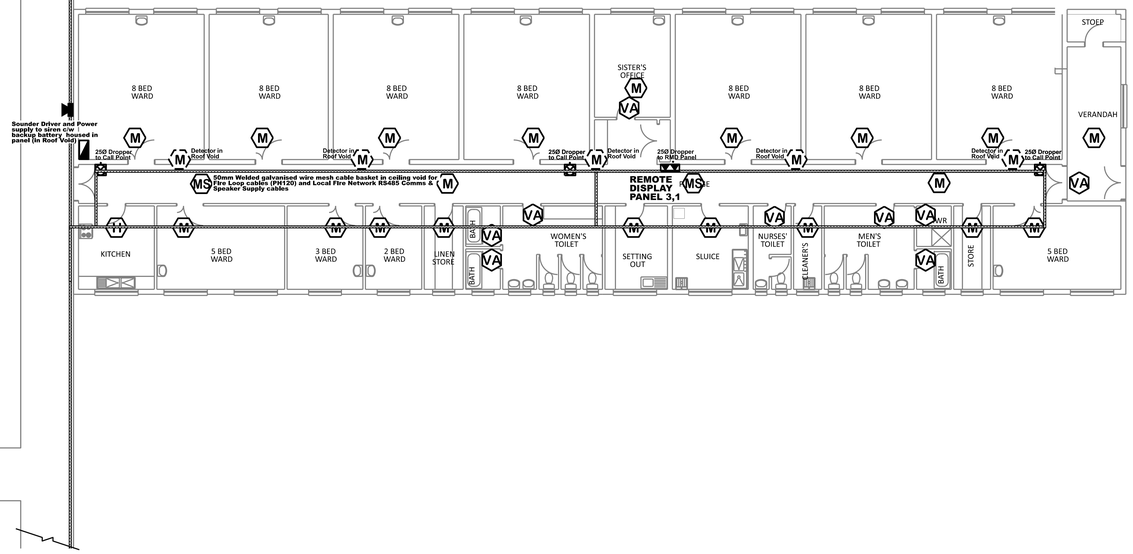
PROJECT NO
1807 FIRE DETECTION

DWG NO.	REV
1807-FD03	*0*

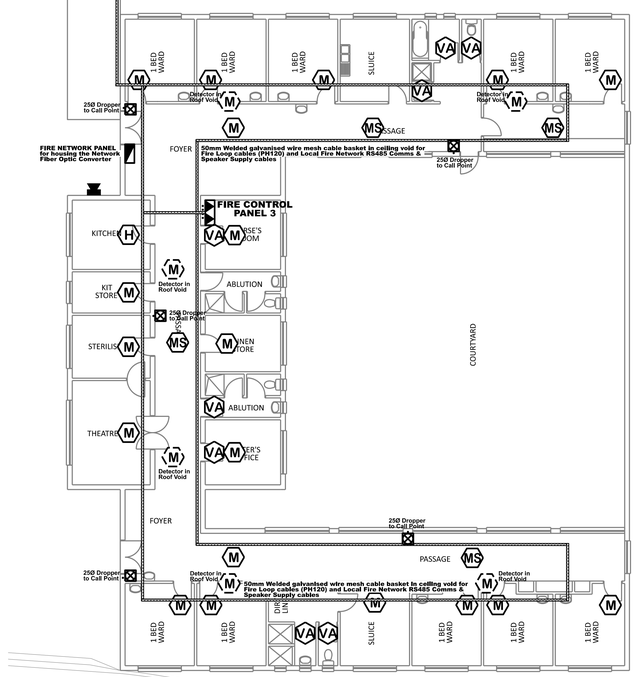
TB WARD MALE



TB WARD FEMALE



ISOLATION

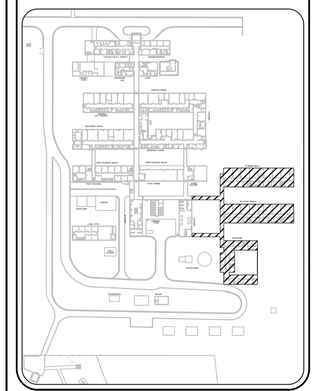


LEGEND:

- FIRE CONTROL PANEL
- VOICE ALARM SYSTEM AMPLIFIER/ POWER AMPLIFIER/ EMERGENCY POWER SUPPLY
- ADDRESSABLE CALL POINT (Break Glass)
- M — ADDRESSABLE MULTISENSOR
- MS — ADDRESSABLE MULTISENSOR C/W SOUNDER BASE
- HS — ADDRESSABLE HORN SOUNDER
- VA — ADDRESSABLE LIGHT BEACON
- I — ADDRESSABLE INTERFACE UNIT
- R — ADDRESSABLE RELAY UNIT
- EVACUATION SIREN (at high level)
- S — EVACUATION CEILING MOUNT SPEAKER WITH FIRE DOME
- DS — REMOTE MICROPHONE DESK TOP BASE STATION
- EM — WALL MOUNTED EMERGENCY MICROPHONE
- 50mm WELDED GALVANISED WIRE MESH CABLE BASKET

NOTES

1) Do not scale from this drawing. Check all given dimensions and site dimensions and/or levels prior to any pricing, manufacture or construction of any item.
2) The copyright for the design and information on this drawing is vested and may not be copied or reproduced without the written authority of the Engineer
3) All conduit and conduit accessories shall bear the SANS mark.Conduit is to be chased into brick and run in inaccessible roof or floor voids. Galvanised trunking wire-ways and/or wiring baskets are to be to run on the surface of roof/floor slabs and walls. No PVC saddles or fixing/ mounting clamps may be used.
4) All detector bases shall be fixed to thin wall galvanised round conduit box. Where detector bases are used on movable/ fixed ceiling tiles the box will be connected with a length of flexible conduit to a conduit box and/or wire-ways/ wiring baskets fixed to the slab soffit.
5) The fire alarm Installation shall be wired as a 2 wire looped system with spurs only within zones, so that it will be possible to access a zone from either end. The fire cable shall have a 2 hour fire rating(PH120) .
6) All systems controlled/ switched by the fire alarm installation that are not wired in a fail-safe configuration (open circuit in alarm condition) shall have a fire rating of no less than 1/2 hour.
7) Fire alarm panel and siren to be supplied from a clearly labelled dedicated circuit on the electrical distribution board



NR.	DATE	REVISIONS

DRAWN	CHECKED
DFB	DFB
DATE: 2023/08/11	SCALE: 1 : 100

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Department:
Health
REPUBLIC OF SOUTH AFRICA

PROJECT
TAFALOFEFE HOSPITAL: WATER AND SANITATION COMPLETION PROJECT SCMU5-24/25-0037(ME)

DRAWING
TAFALOFEFE HOSPITAL: FIRE DETECTION ISOLATION & TB WARDS FLOOR PLAN

PROJECT NO
1807 FIRE DETECTION

DWG NO.	REV
1807-FD04	*0*