



## **TSWELOPELE LOCAL MUNICIPALITY**

### **RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

**CIDB GRADING: 6ME OR HIGHER**

**TENDER NO. SCM/TSW/14/2025-2026.**

**CLOSING DATE: 01 DECEMBER 2025**

**CLOSING TIME: 12H00**

**ISSUED BY:**

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**Tenderer .....**

**CSD No. ....**

**CIDB Registration Number:..... Grade:.....**

**Total price inclusive of Value added Tax: R .....**

**Amount in Words.....**

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## **T1 TENDERING PROCEDURES**

### **T1.1 TENDER NOTICE AND INVITATION TO TENDER**

Bidders are hereby invited for the retrofitting of 6 sewer pump stations , installation of inline grinders and repairs to waste water treatment plant in Hoopstad and Tikwana. Bidders must have CIDB Grading of 6ME or Higher.

Bid documents will be available as from the **10<sup>th</sup> November 2025, Monday**, on the website of the Municipality or e-tender.

No **briefing session** will be held.

Bids are to be completed in accordance with the conditions and rules contained in the bid documents. All documents must be sealed and labelled with the Bid number and description, and placed in the tender box, at the offices of **Tswelopele Local Municipality, Bosman Street, Bultfontein, 9670**, not later than **12h00 on Monday, 01 December 2025**.

All bids should be valid for **90 days** as from the closing date.

Bid documents which are not deposited in the tender box by **12h00** on the closing date will not be accepted nor considered.

**Procurement related enquiries may be directed to Mr Kennedy Lebitsa at 051 853 1111 and Technical related enquiries may be directed to Mr Lebohang Malokase at 051 853 1111 from 08h00 to 16h00.**

The lowest or any bid will not necessarily be accepted and Tswelopele Local Municipality reserves the right not to consider any bid suitably endorsed or comprehensively completed, as well as the right to accept a bid in whole or part. Any bidder not contacted within 90-120 days after the closing date must consider their proposal unsuccessful.

The 80/20 Preferential Points System will be used to evaluate this bid in line with the Preferential Procurement Policy Framework Act, 2011. *Bidders will be evaluated on functionality first, only those qualifying by achieving the minimum cut off point of 60% will be evaluated on administrative compliance and then price and specific points.*

## **RETURNABLE DOCUMENTS**

- Completed Tender Enquiry document
- The tender should be returned complete as per the issued document
- Form of offer and acceptance signed
- The completed Contract document, the acceptance page signed in full and all other pages initialled at the bottom or signed in full as required.
- Schedule A – Bill of quantities electronic copy
- Applicable schedule of rates for plant and labour
- Valid CIDB Contractor Registration Certificate (minimum of **6ME** or higher for lead partner of Joint Venture of CIDB registered entities with the JV CIDB scoring achieving the required minimum)
- Letter of Good standing with Compensation Commissioner
- Certificate of Compliance with the Employment Equity Act (if employing more than 50 employees)
- Proof of your Workmen's compensation registration
- Proof of contractor's guarantee
- Bidding entity company profile
- Proposed Project Organogram and CVs of key personnel
- ORHVS certificates, first aid certificates and vehicle drivers'/operator licences/certificates
- Proposed construction programme (Gantt chart showing activities & resources) in Microsoft Projects or similar software
- Projected cash flow statement and invoicing schedule
- Signed Completion certificates or similar documentation for completed similar projects
- Supporting documents for claiming of functionality points
- Other items specified and completed throughout this document.
- CSD summary report or CSD number
- Latest Municipal rates & taxes account (not older than 3 months) which is not in arrears for more than 3 months for the company & directors/trustees/members/shareholders.
- In the event of a tenant (renting) a copy of a valid signed lease agreement for the company & directors/trustees/members/shareholders and the latest Municipal statement.



## **PART T1**

# **TENDERING PROCEDURES**

## **T1.2 TENDER DATA**

### **T1.2.1 STANDARD CONDITIONS OF TENDER**

The conditions of tender are the Standard Conditions of Tender as contained in **Annex F** of the **CIDB** Standard for Uniformity in Construction Procurement which are reproduced without amendment or alteration for the convenience of tenderers. The Standard Conditions of Tender make 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 Standard Conditions of Tender.

#### **F.1 General**

##### **F.1.1 Actions**

The Employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in F.2 and F.3, timeously and with integrity, and behave equitably, honestly and transparently.

##### **F.1.2 Tender Documents**

The documents issued by the Employer for the purpose of a tender offer are listed in the tender data. The tender documents issued by Tswelopele Local Municipality comprise of the following:

#### **Part T1: Tendering Procedures**

- T1.1 Tender notice and invitation to tender
- T1.2 Tender Data
- T1.3 Preferential Procurement Regulations – Tswelopele Local Municipality

#### **Part T2: Returnable Documents**

- T2.1 List of returnable documents
- T2.2 Returnable schedules

#### **Part C1: Agreements and Contract Data**

- C1.1 Form of offer and acceptance
- C1.2 Contract Data
- C1.3 Blasting Indemnity

#### **Part C2: Pricing data**

- C2.1 Pricing instructions
- C2.2 Activity schedules / Bills of Quantities
- C2.3 Summary of schedule of works

#### **Part C3: Scope of work**

- C3 .1 Description of Works
- C3. 2 Standard Specifications – Mechanical, Electrical, Control and Instrumentation Engineering

- C3. 3 Technical Specifications – Mechanical Engineering
- C3. 4 Technical Specifications – Electrical, Control and Instrumentation Engineering
- C3. 5 Standard and Technical Specifications – Civil Engineering Works
- C3. 6 HIV/AIDS Requirements
- C3. 7 Occupational Health and Safety

**Part C4: Site Information**

- C4.1 Site Information

**Part C5: Contract Drawings**

- C5. 1 Contract Drawings

**F.1.3 Interpretation**

- F.1.3.1** The Tender Data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.
- F.1.3.2** These conditions of tender, the Tender Data and tender schedules which are only required for tender evaluation purposes, shall not form part of any contract arising from the invitation to tender.
- F.1.3.3** For the purposes of these conditions for the calling for expressions of interest, the following definitions apply:
  - (a) **Comparative offer** means the tenderer's financial offer after the factors of non-firm prices, all unconditional discounts and any other tendered parameters that will affect the value of the financial offer have been taken into consideration
  - (b) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the Employer or his staff or agents in the tender process; and
  - (c) **Fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the Employer, including collusive practices intended to establish prices at artificial levels
  - (d) **Quality (Functionality)** means the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

**F.1.5 the Employer's right to accept or reject any tender offer**

- F.1.5.1** The Employer may accept or reject any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The Employer shall not accept or incur any liability to a tenderer for such cancellation and rejection but will give reasons for such action upon written request to do so.
- F.1.5.2** The Employer may not subsequent to the cancellation or abandonment of a tender process or the rejection of all tender offers re-issue a tender covering substantially

the same scope of work within a period of six months unless only one tender was received and such tender was returned unopened to the tenderer.

## F.2 Tenderers obligation

### F2.1 Eligibility

**F2.1.1** Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and have in their employ management and supervisory staff satisfying the requirements of the Scope of Work for labour intensive competencies for supervisory, and the tenderer, or any of his principals, is not under any restriction to do business with employer.

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

F2.1.2.1 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 submit tenders:

a) contractors who have a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a **6ME or Higher** class of construction work; and

b) contractors registered as potentially emerging enterprises with the CIDB who are registered in one contractor grading designation lower than that required in terms of a) above

F2.1.2.2 Joint ventures are eligible to submit tenders provided that:

- a) Every member of the joint venture is registered with the CIDB;
- b) The lead partner has a contractor grading designation in the **6ME or Higher** class of Mechanical Engineering construction work; and
- c) 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 **6ME or Higher**
- (d) A Joint Venture Agreement in line with CIDB Regulations and **Tswelopele Local Municipality** Supply Chain Management Policy in SBD 6.1 (8).
- (e) **CIDB** Certificates or CRS Numbers for both Joint Venture Partners are attached.

### F.2.2 Cost of tendering

Accept that the Employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer satisfy requirements.

### F.2.3 Check documents

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

**F.2.4 Confidentiality and copyright of documents**

Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the Employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

**F.2.5 Reference documents**

Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, Conditions of Contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

**F.2.6 Acknowledge addenda**

Acknowledge receipt of addenda to the tender documents, which the Employer may issue, and if necessary apply for an extension to the closing time stated in the Tender Data, in order to take the addenda into account.

**F.2.7 Site visit and clarification meeting**

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

**F.2.8 Seek clarification**

Request clarification of the tender documents, if necessary, by notifying the Employer at least five working days before the closing time stated in the Tender Data.

**F.2.9 Insurance**

Be aware that the extent of insurance to be provided by the Employer (if any) may not be for the full cover required in terms of the Conditions of Contract identified in the Contract Data. The tenderer is advised to seek qualified advice regarding insurance.

**F.2.10 Pricing the tender offer**

**F.2.10.1** Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes (except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable 14 days before the closing time stated in the Tender Data.

**F.2.10.2** Show VAT payable by the Employer separately as an addition to the tendered total of the prices.

**F.2.10.3** Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the Conditions of Contract identified in the Contract Data.

- F.2.10.4** State the rates and prices in Rand unless instructed otherwise in the Tender Data. The Conditions of Contract identified in the Contract Data may provide for part payment in other currencies.

**F.2.11 Alterations to documents**

Not make any alterations or additions to the tender documents, except to comply with instructions issued by the Employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited.

**F.2.12 Alternative tender offers**

- F.2.12.1** Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

- F.2.12.2** Accept that an alternative tender offer may be based only on the criteria stated in the Tender Data or criteria otherwise acceptable to the Employer.

**F.2.13 Submitting a tender offer**

- F.2.13.1** Submit a tender offer to provide the whole of the works, services or supply identified in the Scope of Work, unless stated otherwise in the Tender Data.
- F.2.13.2** Return all returnable documents to the Employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing in black ink.
- F.2.13.3** Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the Tender Data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the Employer.
- F.2.13.4** Sign the original and all copies of the tender offer where required in terms of the Tender Data. The Employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the Employer shall hold liable for the purpose of the tender offer.
- F.2.13.5** Each package shall state on the outside the Employer's address and identification details stated in the Tender Data, as well as the tenderer's name and contact address.
- F.2.13.6** Where a two-envelope system is required in terms of the Tender Data, place and seal the returnable documents listed in the Tender Data in an envelope marked "financial proposal" and place the remaining returnable documents in an envelope marked "technical proposal". Each envelope shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

**F.2.13.8** Accept that the Employer shall not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

**F.2.14 Information and data to be completed in all respects**

Accept that tender offers, which do not provide all the data or information requested completely and, in the form, required, may be regarded by the Employer as non-responsive.

**F.2.15 Closing time**

**F.2.15.1** Ensure that the Employer receives the tender offer at the address specified in the Tender Data not later than the closing time stated in the Tender Data. Proof of posting shall not be accepted as proof of delivery. The Employer shall not accept tender offers submitted by telegraph, telex, facsimile or e-mail, unless stated otherwise in the Tender Data.

**F.2.15.2** Accept that, if the Employer extends the closing time stated in the Tender Data for any reason, the requirements of these conditions of tender apply equally to the extended deadline

**F.2.16 Tender offer validity**

**F.2.16.1** Hold the tender offer(s) valid for acceptance by the Employer at any time during the validity period stated in the Tender Data after the closing time stated in the Tender Data.

**F.2.16.2** If requested by the Employer, consider extending the validity period stated in the Tender Data for an agreed additional period.

**F.2.17 Clarification of tender offer after submission**

Provide clarification of a tender offer in response to a request to do so from the Employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the total of the prices or substance of the tender offer is sought, offered, or permitted. The total of the prices stated by the tenderer shall be binding upon the tenderer.

**F.2.18 Provide other material**

**F.2.18.1** Provide, on request by the Employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), pre-referencing arrangements, or samples of materials, considered necessary by the Employer for the purpose of a full and fair risk assessment. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the Employer's request, the Employer may regard the tender offer as non-responsive.

**F.2.18.2** Dispose of samples of materials provided for evaluation by the Employer, where required.



### **F.2.19 Inspections, tests and analysis**

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

### **F.2.20 Submit securities, bonds, policies, etc.**

If requested, submit for the Employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the Conditions of Contract identified in the Contract Data.

### **F.2.21 Check final draft**

Check the final draft of the contract provided by the Employer within the time available for the Employer to issue the contract.

### **F.2.22 Return of other tender documents**

If so instructed by the Employer, return all retained tender documents within 28 days after the expiry of the validity period stated in the Tender Data.

### **F.2.23 Certificates**

Include in the tender submission or provide the Employer with any certificates as stated in the Tender Data.

## **F.3 The Employer's undertakings**

### **F.3.1 Respond to request from the tenderer**

**F.3.1.1** Unless otherwise stated in the tender Data respond to a request for clarification received up to five working days before the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.

### **F.3.2 Issue Addenda**

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date of the Tender Notice until seven days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, will then notify it to all tenderers who drew documents.

### **F.3.3 Return late tender offers**

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

### **F.3.4 Opening of tender submissions**

- F.3.4.2** Announce at the opening held immediately after the opening of tender submissions, at a venue indicated in the Tender Data, the name of each tenderer whose tender offer is opened, the total of his prices, preferences claimed and time for completion, if any, for the main tender offer only.
- F.3.4.3** Make available the record outlined in F.3.4.2 to all interested persons upon request if the employer deemed necessary.

**F.3.5 Two-envelope system**

- F.3.5.1** Where stated in the Tender Data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the Tender Data and announce the name of each tenderer whose technical proposal is opened
- F.3.5.2** Evaluate the quality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the quality evaluation above the minimum number of points for quality stated in the Tender Data, and announce the score obtained for the technical proposals and the total price and any preferences claimed. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for quality.

**F.3.6 Non-disclosure**

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

**F.3.7 Grounds for rejection and disqualification**

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

**F.3.8 Test for responsiveness**

- F.3.8.1** Determine, on opening and before detailed evaluation, whether each tender offer properly received:
- a) Meets the requirements of these Conditions of Tender,
  - b) Has been properly and fully completed and signed, and
  - c) is responsive to the other requirements of the tender documents.
- F.3.8.2** A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

- a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- b) change the Employer's or the tenderer's risks and responsibilities under the contract, or
- c) Affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation

**F.3.9 Arithmetical errors, omissions and discrepancies.**

**F.3.9.1** 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.

**F.3.9.2** Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with F.3.11 for:

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

**F.3.9.3** Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

**F.3.9.4** Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

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

**F.3.10 Clarification of a tender offer**

Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

### F.3.11 Evaluation of tender offers

#### F3.11.1 General

Appoint an evaluation panel of not less than three persons. Reduce each responsive tender offer to a comparative offer and evaluate it using the tender evaluation method that is indicated in the Tender Data and described below:

| Method No.                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Method 1:</b><br>Financial offer                               | <ol style="list-style-type: none"> <li>1) Rank tender offers from the most favourable to the least favourable comparative offer.</li> <li>2) Recommend highest ranked tenderer for the award of the contract, unless there are compelling and justifiable reasons not to do so.</li> </ol>                                                                                                                                                                                                                                                                                                         |
| <b>Method 2:</b><br>Financial offer and preferences               | <ol style="list-style-type: none"> <li>1) Score tender evaluation points for financial offer.</li> <li>2) Confirm that tenderers are eligible for the preferences claimed and if so, score tender evaluation points for referencing.</li> <li>3) Calculate total tender evaluation points.</li> <li>4) Rank tender offers from the highest number of tender evaluation points to the lowest.</li> <li>5) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.</li> </ol>        |
| <b>Method 3:</b><br>Financial offer and quality                   | <ol style="list-style-type: none"> <li>1) Score quality, rejecting all tender offers that fail to score the minimum number of points for quality stated in the Tender Data.</li> <li>2) Score tender evaluation points for financial offer.</li> <li>3) Calculate total tender evaluation points.</li> <li>4) Rank tender offers from the highest number of tender evaluation points to the lowest.</li> <li>5) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.</li> </ol> |
| <b>Method 4:</b><br>Financial offer, <b>Quality/Functionality</b> | <ol style="list-style-type: none"> <li>1) Score <b>Quality/Functionality</b>, rejecting all tender offers that fail to score the minimum number of points for <b>Quality/Functionality</b> stated in the Tender Data.</li> <li>2) Score tender evaluation points for financial offer.</li> </ol>                                                                                                                                                                                                                                                                                                   |

| Method No.                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| and<br><b>Preferences</b> | <p>3) Confirm that tenderers are eligible for the preferences claimed, and if so, score tender evaluation points for preference.</p> <p>4) Calculate total tender evaluation points.</p> <p>5) Rank tender offers from the highest number of tender evaluation points to the lowest.</p> <p>6) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.</p> |

**NOTE: Method 4 will be used to evaluate this tender. See below for evaluation criteria.**

## EVALUATION CRITERIA

THIS BID WILL BE EVALUATED AND ADJUDICATED ACCORDING TO THE FOLLOWING CRITERIA:

1. Relevant specifications
2. Value for money
3. Capability to execute the contract
4. PPPFA & associated regulations
5. TLM SCM Policy
6. Bids will be evaluated in terms of the following two stages:

### **Stage 1: Evaluation on Quality/Functionality**

Under functionality, Bidders must achieve a minimum of 60% of quality/functionality points in order to be considered for further evaluation in stage 2 (Evaluation on Price and Specific Goals).

**NB: Only the combined Price & Specific Goals points will determine the highest point scoring bidder to be awarded the contract**

**Table 1: Technical Functionality**

| <b>Functionality</b>                                 | <b>100 Points</b> |
|------------------------------------------------------|-------------------|
| A. Experience and completion on similar projects     | 45                |
| B. Capacity and resources relevant to scope of works | 40                |
| C. Financial viability (Bank rating)                 | 5                 |
| D. Works program and Cash Flow                       | 10                |
| <b>Minimum Threshold = 60 points</b>                 |                   |

**Table 2: Technical Functionality Point Allocation**

| <b>A. Experience on similar projects within the last 10 years</b>                                                                                                          | <b>Max. 45 Points</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>Four (4) projects</b> (sewer / water pumping stations with pipelines and project cost over R3 million). Signed appointment letters and signed Completion Certificates.  | 45                    |
| <b>Three (3) projects</b> (sewer / water pumping stations with pipelines and project cost over R3 million). Signed appointment letters and signed Completion Certificates. | 30                    |
| <b>Two (2) projects</b> (sewer / water pumping stations with pipelines and project cost over R3 million). Signed appointment letters and signed Completion Certificates.   | 20                    |

|                                                                                                                                                                                                                              |                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>One (1) projects</b> (sewer / water pumping stations with pipelines and project cost over R3 million). Signed appointment letters and signed Completion Certificates.                                                     | <b>10</b>             |
| <b>Zero (0) projects</b> (sewer / water pumping stations with pipelines and project cost over R3 million). Signed appointment letters and signed Completion Certificates.                                                    | <b>0</b>              |
| <b>B. Key Personnel (Non-submission of CV, SA ID Copy and Engineering Qualifications is 0 points)</b>                                                                                                                        | <b>Max. 40 Points</b> |
| <b>B1. Site Supervisor (Maximum of 15 points)</b>                                                                                                                                                                            |                       |
| 1 x Site Supervisor with more than 10 years relevant work experience. Detailed CV, ID copy and Qualification certificates must be provided.                                                                                  | <b>15</b>             |
| 1 x Site Supervisor with 5 or more years relevant work experience. Detailed CV, ID copy and Qualification certificates must be provided.                                                                                     | <b>10</b>             |
| 1 x Site Supervisor with less than 5 years relevant work experience. Detailed CV, ID copy and Qualification certificates must be provided.                                                                                   | <b>0</b>              |
| <b>B2. Artisans (Maximum of 25 points)</b>                                                                                                                                                                                   |                       |
| 1 x Qualified HT Electricians / Millwrights with 5 or more years of relevant experience. Copy of Journeyman Certificate, CV and ID must be provided. Two (2) points will be awarded for 1 to 4 years of relevant experience. | <b>10</b>             |
| 1 x Qualified Fitter with 5 or more years of relevant experience. Copy of Journeyman Certificate, CV and ID must be provided. Two (2) points will be awarded for 1 to 4 years of relevant experience.                        | <b>10</b>             |
| 1 x Qualified instrumentation artisan / technician with 5 or more years of relevant experience. CV, certificates and ID copy must be provided. Two (2) points will be awarded for 1 to 4 years of relevant experience.       | <b>5</b>              |
| <b>C. Financial Viability</b>                                                                                                                                                                                                | <b>Max 5 Points</b>   |
| Credit rating / bank code of A to C (not older than 3 months from the closing date)                                                                                                                                          | <b>5</b>              |
| <b>D. Works Program &amp; Cash Flow</b>                                                                                                                                                                                      | <b>Max 10 Points</b>  |
| Level 2 schedule in Microsoft Projects / Similar scheduling software.                                                                                                                                                        | <b>5</b>              |
| Project Cash Flow with invoicing schedule.                                                                                                                                                                                   | <b>5</b>              |

**Stage 2: Evaluation on Price and Specific Goals 80/20**

**FINANCIAL OFFER AND EVALUATION ON PRICE POINTS**

- Score Bid evaluation points for financial offer.
- Confirm that Bidders are eligible for the Specific Goals claimed, and if so, score Bid evaluation points for specific Goals.

- Calculate total Bid evaluation points (Price points plus specified goals points)
- Rank Bid offers from the highest number of Bid evaluation points to the lowest.
- The bidder obtaining the highest number of total points will be awarded the contract.
- Preference points shall be calculated after prices have been brought to a comparative basis taking into account all factors of non-firm prices and all unconditional discounts;
- Points scored must be rounded off to the nearest 2 decimal places.
- In the event that two or more bids have scored equal total points, the successful bids must be the one scoring the highest number of preference points for Specific goals Points
- However, when functionality is part of the evaluation process and two or more bids have scored equal points including equal preference points for specific Goals, the successful bid must be the one scoring the highest score for functionality.
- Should two or more bids be equal in all respects, the award shall be decided by the drawing of lots.

## 2.2 Price formula

$$Np = 80[1 - (Pt - Pmin)]$$

Pmin

- Where: Np = the number of bid/tender adjudication points awarded for price.
- Pt = the bid/tender sum (corrected if applicable) of the responsive bid under consideration.
- Pmin = the bid/tender sum (corrected if applicable) of the lowest responsive tender/bid.

## 2.3 Scoring for Specific Goals

### **Specified Goals to be calculated as follows:**

**Points for the specific goals for contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race:**

| Black-owned                   | Number of points on 80/20 points system | Number of points on 90/10 points system | Required Proof         |
|-------------------------------|-----------------------------------------|-----------------------------------------|------------------------|
| 51-100%Black-owned enterprise | 8                                       | 3                                       | CSD Report and ID Copy |
| 41-50% Black-owned enterprise | 6                                       | 2                                       | CSD Report and ID Copy |



|                               |   |   |                        |
|-------------------------------|---|---|------------------------|
| 31-40%Black-owned enterprise  | 4 | 1 | CSD Report and ID Copy |
| 21-30% Black-owned enterprise | 2 | 0 | CSD Report and ID Copy |
| 0-20% Black-owned enterprise  | 1 | 0 | CSD Report and ID Copy |

**Points for the specific goals for contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of gender:**

| <b>Women-owned</b>             | <b>Number of points on 80/20 points system</b> | <b>Number of points on 90/10 points system</b> | <b>Required Proof</b>  |
|--------------------------------|------------------------------------------------|------------------------------------------------|------------------------|
| 51-100% Women-owned enterprise | 4                                              | 3                                              | CSD Report and ID Copy |
| 31-50% Women-owned enterprise  | 3                                              | 1                                              | CSD Report and ID Copy |
| 11-30% Women-owned enterprise  | 2                                              | 1                                              | CSD Report and ID Copy |
| 1-10% Women-owned enterprise   | 1                                              | 1                                              | CSD Report and ID Copy |

**Points for the specific goals for contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of disability:**

| <b>Disability-owned</b>           | <b>Number of points on 80/20 points system</b> | <b>Number of points on 90/10 points system</b> | <b>Required Proof</b>                       |
|-----------------------------------|------------------------------------------------|------------------------------------------------|---------------------------------------------|
| 51-100% Disabled-owned enterprise | 4                                              | 2                                              | ID Copy, CSD Report and medical certificate |
| 31-50% Disabled-owned enterprise  | 3                                              | 1                                              | ID Copy, CSD Report and medical certificate |
| 11-30% Disabled-owned enterprise  | 2                                              | 1                                              | ID Copy, CSD Report and medical certificate |
| 1-10% Disabled-owned enterprise   | 1                                              | 0                                              | ID Copy, CSD Report and medical certificate |

**Points for the specific goals for contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of youth:**

| Youth-owned                    | Number of points on 80/20 points system | Number of points on 90/10 points system | Required Proof         |
|--------------------------------|-----------------------------------------|-----------------------------------------|------------------------|
| 51-100% Youth-owned enterprise | 4                                       | 2                                       | CSD Report and ID Copy |
| 31-50% Youth-owned enterprise  | 3                                       | 1                                       | CSD Report and ID Copy |
| 11-30% Youth-owned enterprise  | 2                                       | 1                                       | CSD Report and ID Copy |
| 1-10% Youth-owned enterprise   | 0                                       | 0                                       | CSD Report and ID Copy |

#### **F.3.11.6 Decimal places**

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

#### **F.3.12 Insurance provided by the Employer**

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and / or certificates of insurance which the Conditions of Contract identified in the Contract Data, require the Employer to provide.

#### **F.3.13 Acceptance of tender offer**

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

- a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
- b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
- c) has the legal capacity to enter into the contract,

- d) is not insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,
- e) Complies with the legal requirements, if any, stated in the tender data, and
- f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

**F.3.13.1** Accept tender offer only if the tenderer satisfies the legal requirements stated in the Tender Data.

**F.3.13.2** Notify the successful tenderer of the Employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the Tender Data or agreed additional period. Providing the form of offer and acceptance does not contain any qualifying statements, it will constitute the formation of a contract between the Employer and the successful tenderer as described in the form of offer and acceptance.

**F.3.14 Prepare contract documents**

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

- a) Addenda issued during the tender period,
- b) Inclusion of some of the returnable documents,
- c) Other revisions agreed between the Employer and the successful tenderer, and
- d) The schedule of deviations attached to the form of offer and acceptance, if any.

**F.3.15 Complete adjudicator's contract**

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

**F.3.16 Notice to Unsuccessful Tenderers**

After the successful tenderer has acknowledged the Employer's notice of acceptance, notify other tenderers that their tender offers have not been accepted.

**F.3.18 Provide copies of the contracts**

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance

### **T1.3        PREFERENTIAL PROCUREMENT REGULATIONS**

#### **Supply Chain Management Procedures**

This Request for Proposals has been compiled and approved by the Bid Specification Committee of Tswelopele Local Municipality established in terms of the Public Finance Management Act and its Regulations.

The bids received will be evaluated by the Bid Evaluation Committee in terms of the bids evaluation criteria described in this document. The Committee will then submit a report on the bids received to the Bid Adjudication Committee.

The Bid Adjudication Committee will make a recommendation to the Accounting Officer or his delegate nominated in writing. The Accounting Officer will either accept the recommendation of the Bid Adjudication Committee or refer it back to the Bid Adjudication Committee for further investigation or award the contract to a different bidder. In the event that the contract is awarded to a different bidder from the one recommended by the Bid Adjudication Committee, the Auditor-General shall be informed of the reasons for the decision.

The above process will, depending upon the complexity of the project and the number of bids received, take between 4 and 6 weeks. Bidders are requested to refrain from making inquiries on progress and/or from submitting unsolicited information regarding their bids and especially from commenting on other bidders' proposals during this time. Tswelopele Local Municipality will endeavour to keep bidders informed of the progress of the process.

## **PART T2**

# **RETURNABLE DOCUMENTS**

**T2            RETURABLE DOCUMENTS**

**T2.1        LIST OF RETURABLE DOCUMENTS**

**T2.1.1      The tenderer must complete the following returable documents:**

- a. Completed Tender Enquiry document
- b. The tender should be returned complete as per the issued document
- c. Form of offer and acceptance signed
- d. The completed Contract document, the acceptance page signed in full and all other pages initialled at the bottom or signed in full as required.
- e. Schedule A – Bill of quantities electronic copy
- f. Valid CIDB Contractor Registration Certificate (minimum of 6ME or higher for lead partner of Joint Venture of CIDB registered entities with the JV CIDB scoring achieving the required minimum)
- g. Letter of Good standing with Compensation Commissioner
- h. Certificate of Compliance with the Employment Equity Act (if employing more than 50 employees)
- i. Proof of your Workmen's compensation registration
- j. Proof of contractor's guarantee
- k. Proposed Project Organogram and CVs of key personnel
- l. ORHVS certificates, first aid certificates and vehicle drivers'/operator licences/certificates
- m. Proposed construction programme (Gantt chart showing activities & resources) in Microsoft Projects or similar software
- n. Projected cash flow statement and invoicing schedule
- o. Signed Completion certificates or similar documentation for completed similar projects
- p. Supporting documents for claiming of functionality points
- q. CSD summary report
- r. Latest Municipal rates & taxes account (not older than 3 months) which is not in arrears for more than 3 months for the company & directors/trustees/members/shareholders.
- s. In the event of a tenant (renting) a copy of a valid signed lease agreement for the company & directors/trustees/members/shareholders and the municipal account statement.

**T2.1.2 Returnable Schedules required for tender evaluation purposes:**

- a) Schedule A - Certificate for authority of companies
- b) Schedule B - Record of Addenda to tender documents
- c) Schedule C – Plant and Equipment
- e) Schedule D– Relevant work experience carried out by  
Tenderer
- f) Schedule E – Tenderer Key Personnel
- g) Schedule F – Full Details of Directors/ Trustees/ Members/  
Shareholders
- h) Schedule G – Company Details Regarding Tenderer
- i) Schedule H – Contractors OHS Management system checklist
- j) Schedule I – Contractors Estimated monthly expenditure
- k) Schedule J – Contractors Labour Content

**T2.1.3 Returnable Schedules that are incorporated into the contract**

- a) MBD 1 – Invitation to Tender
- b) MBD 4 – Declaration of interest
- c) MBD 5 – Declaration for procurement above R10 Million
- d) MBD 6.1 – Preference Points
- e) MBD 8 – Declaration of Past Supply Chain Management  
Practises
- f) MBD 9 - Certificate of Independent bid determination

**SCHEDULE A: CERTIFICATE OF AUTHORITY FOR COMPANIES**

This Returnable Schedule is to be completed by companies and close corporations. Indicate the status of the tenderer by ticking the appropriate box hereunder. The tenderer must complete the certificate set out below for the relevant category.

| <b>A<br/>Company</b> | <b>C<br/>Joint Venture</b> | <b>E<br/>Close Corporation</b> |
|----------------------|----------------------------|--------------------------------|
|                      |                            |                                |

**B.1 Certificate for company**

I, ....., managing director of the board of directors of ..... hereby confirm that by resolution of the board taken on .....20....., Mr./Ms ..... , has been duly authorized to sign all documents in connection with this tender and any contract resulting from it on behalf of the company. As witnesses:-

1. ....  
Managing director
2. ....  
Date

**B.2. Certificate for Joint Venture**

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

| <b>NAME OF FIRM</b> | <b>ADDRESS</b> | <b>AUTHORISING SIGNATURE, NAME &amp; CAPACITY</b> |
|---------------------|----------------|---------------------------------------------------|
| Lead partner        |                |                                                   |
|                     |                |                                                   |
|                     |                |                                                   |
|                     |                |                                                   |
|                     |                |                                                   |



**B.3 Certificate for close Corporation**

We, the undersigned, being the key members in the business trading as

.....

.

hereby authorise Mr/Ms ..... , to  
sign all documents in connection with the tender and any contract resulting from it on our behalf of:

| NAME | ADDRESS | SIGNATURE | DATE |
|------|---------|-----------|------|
|      |         |           |      |
|      |         |           |      |
|      |         |           |      |
|      |         |           |      |
|      |         |           |      |

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

**SCHEDULE B: RECORD OF ADDENDA TO TENDER DOCUMENTS**

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

|    | Date | Title or Details |
|----|------|------------------|
| 1. |      |                  |
| 2. |      |                  |
| 3. |      |                  |
| 4. |      |                  |
| 5. |      |                  |
| 6. |      |                  |
| 7. |      |                  |
| 8. |      |                  |

**NOTE:** Attach additional pages if more space is required.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Position: \_\_\_\_\_

Tenderer: \_\_\_\_\_

**SCHEDULE C: PLANT AND EQUIPMENT**

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

(a) 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.*

(b) 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: \_\_\_\_\_

**RETROFITTING OF 6 sewer pump stations , INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

**RETURNABLE SCHEDULE**

**SCHEDULE D: RELEVANT WORK CARRIED OUT BY TENDERER**

**Previous experience**

Provide the following information on relevant previous experience (indicate specifically projects of similar or larger size and/or which is similar with regard to type of work. In addition to any requirements, bidders must furnish particulars of:

- (a) all Construction Work of similar nature of the assignment provided to an organ of state in the last five years;
- (b) any similar Construction Work provided to an organ of state in the last five years.

This information is material to the award of the Contract.

| Project Description | Contract Value<br>(VAT excl) | Project Duration |        | Expenditure<br>@<br>Completion | Reference |               |         |
|---------------------|------------------------------|------------------|--------|--------------------------------|-----------|---------------|---------|
|                     |                              | Start            | Finish |                                | Name:     | Organisation: | Tel No: |
|                     |                              |                  |        |                                |           |               |         |
|                     |                              |                  |        |                                |           |               |         |
|                     |                              |                  |        |                                |           |               |         |
|                     |                              |                  |        |                                |           |               |         |
|                     |                              |                  |        |                                |           |               |         |
|                     |                              |                  |        |                                |           |               |         |

**Name of Tendering Entity:**

\_\_\_\_\_

**Signature:**

\_\_\_\_\_

**DATE:**

\_\_\_\_\_

SCHEDULE E: TENDERER'S KEY PERSONNEL

| NAME | POSITION | NQF QUALIFICATION |
|------|----------|-------------------|
|      |          |                   |
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|      |          |                   |
|      |          |                   |

TENDERER: .....

SIGNATURE: .....

DATE: .....

**SCHEDULE F**

**FULL DETAILS OF DIRECTORS / TRUSTEES / MEMBERS / SHAREHOLDERS.**

| <b>Full Name</b> | <b>Identity Number</b> | <b>Personal Tax<br/>Reference Number</b> | <b>State Employee<br/>Number / Perusal<br/>Number</b> |
|------------------|------------------------|------------------------------------------|-------------------------------------------------------|
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |
|                  |                        |                                          |                                                       |

**SCHEDULE G**

**COMPANY DETAILS REGARDING TENDERER**

1. Complete Name : .....  
(Business)
- Registered Address : .....
- Registration No. : .....
- Type of Business : .....

Indicate with an "X"

| One-man<br>Business | Partnership | Private<br>Company | Closed<br>Corporation | Joint<br>Venture | Consortium | Others |
|---------------------|-------------|--------------------|-----------------------|------------------|------------|--------|
|---------------------|-------------|--------------------|-----------------------|------------------|------------|--------|

Date registered : .....

Tel. No. : (W) Code: ..... No.: .....

Cell No. : .....

Fax No. : Code: ..... No.: .....

E-mail : .....

**2. AUTHORIZED / CONTACT PERSON**

Name : .....

Title : .....

**3. FINANCIAL DETAIL**

**(1) Bank detail**

Bank : .....

Branch : .....

Account Name: .....

Account No. : .....

Contact person: .....

Tel No. : .....

Fax No. : .....

| SCHEDULE H: CONTRACTORS' OHS MANAGEMENT SYSTEM CHECKLIST |                                                                                                                     | YES                      | / | NO                       |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------|---|--------------------------|
| <b>1.</b>                                                | <b>OHS Policy and Management</b>                                                                                    |                          |   |                          |
| 1.1                                                      | Is there a written company health and safety policy?                                                                | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 1.2                                                      | Does the company have an OHS Management System?                                                                     | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 1.3                                                      | Is there a company OHS Management System manual or plan?                                                            | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 1.4                                                      | Are health and safety responsibilities clearly identified for all levels of staff?                                  | <input type="checkbox"/> |   | <input type="checkbox"/> |
| <b>2.</b>                                                | <b>Safe Work Practices and Procedures</b>                                                                           |                          |   |                          |
| 2.1                                                      | Has the company prepared safe operating procedures or specific safety instructions relevant to its operations?      | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 2.2                                                      | Does the company have any permit to work systems?                                                                   | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 2.3                                                      | Is there a documented incident investigation procedure?                                                             | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 2.4                                                      | Are there procedures for maintaining, inspecting and assessing the hazards of plant operated/ owned by the company? | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 2.5                                                      | Are there procedures for storing and handling hazardous substances?                                                 | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 2.6                                                      | Are there procedures for identifying, assessing and controlling risks associated with manual handling?              | <input type="checkbox"/> |   | <input type="checkbox"/> |
| <b>3.</b>                                                | <b>OHS Training</b>                                                                                                 |                          |   |                          |
| 3.1                                                      | Is health and safety training conducted in the company                                                              | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 3.2                                                      | Is a record maintained of all training and induction programs undertaken for employees in the company?              | <input type="checkbox"/> |   | <input type="checkbox"/> |
| <b>4.</b>                                                | <b>Health and Safety Workplace Inspection</b>                                                                       |                          |   |                          |
| 4.1                                                      | Are regular health and safety inspections at worksites undertaken?                                                  | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 4.2                                                      | Are standard workplace inspection checklists used to conduct health and safety inspections?                         | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 4.3                                                      | Is there a procedure by which employees can report hazards at workplaces?                                           | <input type="checkbox"/> |   | <input type="checkbox"/> |
| <b>5.</b>                                                | <b>Health and Safety Consultation</b>                                                                               |                          |   |                          |
| 5.1                                                      | Is there a workplace health and safety committee?                                                                   | <input type="checkbox"/> |   | <input type="checkbox"/> |
| 5.2                                                      | Are employees involved in decision making over OHS matters?                                                         | <input type="checkbox"/> |   | <input type="checkbox"/> |
|                                                          |                                                                                                                     | <input type="checkbox"/> |   | <input type="checkbox"/> |



5.3 Are there employee elected health and safety representatives?

**6. OHS Performance Monitoring**

6.1 Is there a system for recording and analysing health and safety performance statistics?

☐ ☐

6.2 Are employees regularly provided with information on company health and safety performance?

☐ ☐

6.3 Has the company ever been convicted of an occupational health and safety offence?

☐ ☐

**7. Health and Safety Plan for this specific contract**

7.1 Does your company's health and safety plan contain the following elements?

☐ ☐

- a) Description of contract
- b) OHS structure for work undertaken under this contract
- c) Induction and safety training
- d) Safe work practices and procedures for specific work undertaken
- e) Risk assessment for specific work undertaken
- f) Workplace inspection schedule for duration of contract
- g) OHS consultative processes to be followed
- h) Emergency procedures for specific contract
- i) Incident recording and investigation procedures
- j) Health and safety performance monitoring arrangements to be implemented during contract

Signed: .....

Name: .....

Position: .....

**SCHEDULE I**  
**CONTRACTORS' ESTIMATED MONTHLY EXPENDITURE**

The tenderer shall state his estimated value of the work to be completed every month, based on his preliminary programme and his tendered unit rates, in the table below.

| MONTH NO. |   | VALUE |
|-----------|---|-------|
| 1:        | R |       |
| 2:        | R |       |
| 3:        | R |       |
| 4:        | R |       |
| 5:        | R |       |
| 6:        | R |       |
| 7:        | R |       |
| 8:        | R |       |
| 9:        | R |       |
| 10:       | R |       |
| 11:       | R |       |
| 12:       | R |       |
| 13:       | R |       |
| 14:       | R |       |
| 15:       | R |       |
| 16:       | R |       |
| 17:       | R |       |
| 18:       | R |       |
| TOTAL     |   | R     |

SIGNED ON BEHALF OF TENDERER:

Note to tenderer:...

**If a tenderer wishes to submit an alternative tender then this form, appropriately completed, shall be attached to the bill of quantities for the alternative proposal.**

**SCHEDULE J: CONTRACTOR LABOUR CONTENT**

The tenderer shall complete the table below to reflect the labour force anticipated to be employed on this contract, including labour employed by sub-contractors.

The specified minimum target value is 15% of Tendered Sum

| TYPE OF LABOUR    | MAN-HOURS | TOTAL WAGE COST<br>(EXCL. VAT) |
|-------------------|-----------|--------------------------------|
| Permanent Labour  |           |                                |
| Temporary Labour  |           |                                |
| SMME/BEE's Labour |           |                                |
| TOTAL             |           |                                |
| PERCENTAGE (%)    |           |                                |

***Note to tenderer: Labour is defined as hourly paid personnel***

SIGNED ON BEHALF OF THE TENDERER:

**MBD1**

**PART A  
INVITATION TO BID**

|                                                                                                   |                                                                                                                                                                                                    |               |                  |               |       |
|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|---------------|-------|
| <b>YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE TSWELOPELE LOCAL MUNICIPALITY</b>        |                                                                                                                                                                                                    |               |                  |               |       |
| BID NUMBER:                                                                                       | SCM/TSW/14/2025-2026.                                                                                                                                                                              | CLOSING DATE: | 01 December 2025 | CLOSING TIME: | 12h00 |
| DESCRIPTION                                                                                       | APPOINTMENT OF A CONTRACTOR RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA. CIDB GRADING: 6ME OR HIGHER |               |                  |               |       |
| <b>THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (MBD7).</b> |                                                                                                                                                                                                    |               |                  |               |       |

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT (*STREET ADDRESS*)

|                             |          |  |           |         |  |
|-----------------------------|----------|--|-----------|---------|--|
|                             |          |  |           |         |  |
|                             |          |  |           |         |  |
|                             |          |  |           |         |  |
|                             |          |  |           |         |  |
|                             |          |  |           |         |  |
| <b>SUPPLIER INFORMATION</b> |          |  |           |         |  |
| NAME OF BIDDER              |          |  |           |         |  |
| POSTAL ADDRESS              |          |  |           |         |  |
| STREET ADDRESS              |          |  |           |         |  |
| TELEPHONE NUMBER            | CODE     |  | NUMBER    |         |  |
| CELLPHONE NUMBER            |          |  |           |         |  |
| FACSIMILE NUMBER            | CODE     |  | NUMBER    |         |  |
| E-MAIL ADDRESS              |          |  |           |         |  |
| VAT REGISTRATION NUMBER     |          |  |           |         |  |
| TAX COMPLIANCE STATUS       | TCS PIN: |  | <b>OR</b> | CSD No: |  |

|                                                                                                         |                                                                                        |                                                                                    |                                                                                            |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>1. ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?</b> | <input type="checkbox"/> Yes <input type="checkbox"/> No<br><br>[IF YES ENCLOSE PROOF] | <b>2. ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?</b> | <input type="checkbox"/> Yes <input type="checkbox"/> No<br><br>[IF YES, ANSWER PART B:3 ] |
| <b>3. TOTAL NUMBER OF ITEMS OFFERED</b>                                                                 |                                                                                        | <b>4. TOTAL BID PRICE</b>                                                          | R                                                                                          |
| <b>5. SIGNATURE OF BIDDER</b>                                                                           | .....                                                                                  | <b>6. DATE</b>                                                                     |                                                                                            |
| <b>7. CAPACITY UNDER WHICH THIS BID IS SIGNED</b>                                                       |                                                                                        |                                                                                    |                                                                                            |
| <b>BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO:</b>                                                  |                                                                                        | <b>TECHNICAL INFORMATION MAY BE DIRECTED TO:</b>                                   |                                                                                            |
| DEPARTMENT                                                                                              |                                                                                        | CONTACT PERSON                                                                     |                                                                                            |
| CONTACT PERSON                                                                                          |                                                                                        | TELEPHONE NUMBER                                                                   |                                                                                            |
| TELEPHONE NUMBER                                                                                        |                                                                                        | FACSIMILE NUMBER                                                                   |                                                                                            |
| FACSIMILE NUMBER                                                                                        |                                                                                        | E-MAIL ADDRESS                                                                     |                                                                                            |
| E-MAIL ADDRESS                                                                                          |                                                                                        |                                                                                    |                                                                                            |

**MBD 4**

**DECLARATION OF INTEREST**

1. Any legal person, including persons employed by the state<sup>1</sup>, or persons having a kinship with persons employed by the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid (includes an advertised competitive bid, a limited bid, a proposal or written price quotation). In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons employed by the state, or to persons connected with or related to them, it is required that the bidder or his/her authorised representative declare his/her position in relation to the evaluating/adjudicating authority where-

- the bidder is employed by the state; and/or
- the legal person on whose behalf the bidding document is signed, has a relationship with persons/a person who are/is involved in the evaluation and or adjudication of the bid(s), or where it is known that such a relationship exists between the person or persons for or on whose behalf the declarant acts and persons who are involved with the evaluation and or adjudication of the bid.

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

2.1 Full Name of bidder or his or her representative .....

2.2 Identity Number:.....

2.3 Position occupied in the Company (director, trustee, shareholder<sup>2</sup>, member):  
.....

2.4 Registration number of company, enterprise, close corporation, partnership agreement or trust:  
.....

2.5 Tax Reference Number: .....

2.6 VAT Registration Number .....

- 2.6.1 The names of all directors / trustees / shareholders / members, their individual identity numbers, tax reference numbers and, if applicable, employee / PERSAL numbers must be indicated in paragraph 3 below.

<sup>1</sup>"State" means –

- (a) any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No. 1 of 1999);
- (b) any municipality or municipal entity;
- (c) provincial legislature;
- (d) national Assembly or the national Council of provinces; or
- (e) Parliament.

<sup>2</sup>"Shareholder" means a person who owns shares in the company and is actively involved in the management of the enterprise or business and exercises control over the enterprise.

- 2.7 Are you or any person connected with the bidder presently employed by the state? **YES / NO**
- 2.7.1 If so, furnish the following particulars:
- Name of person / director / trustee / shareholder/ member .....
- Name of state institution at which you or the person connected to the bidder is employed : .....
- Position occupied in the state institution: .....
- Any other particulars:
- .....
- .....
- .....
- 2.7.2 If you are presently employed by the state, did you obtain the appropriate authority to undertake remunerative work outside employment in the public sector? **YES / NO**
- 2.7.2.1 If yes, did you attach proof of such authority to the bid document? **YES / NO**
- (Note: Failure to submit proof of such authority, where applicable, may result in the disqualification of the bid.**
- 2.7.2.2 If no, furnish reasons for non-submission of such proof:
- .....
- .....
- .....
- 2.8 Did you or your spouse, or any of the company's directors / trustees / shareholders / members or their spouses conduct business with the state in the previous twelve months? **YES / NO**
- 2.8.1 If so, furnish particulars:
- .....
- .....
- .....
- 2.9 Do you, or any person connected with the bidder, have any relationship (family, friend, other) with a person employed by the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**
- 2.9.1 If so, furnish particulars:
- .....
- .....
- .....
- 2.10 Are you, or any person connected with the bidder, aware of any relationship (family, friend, other) between any other bidder and any person employed by the state who may be involved with the evaluation and or adjudication of this bid? **YES/NO**
- 2.10.1 If so, furnish particulars.
- .....
- .....
- .....

2.11 Do you or any of the directors / trustees / shareholders / members  
of the company have any interest in any other related companies  
whether or not they are bidding for this contract? **YES/NO**

2.11.1 If so, furnish particulars:

.....  
.....  
.....

**3. Full details of directors / trustees / members / shareholders.**

| Full Name | Identity Number | Personal Income Tax<br>Reference Number | State Employee<br>Number / Persal<br>Number |
|-----------|-----------------|-----------------------------------------|---------------------------------------------|
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |
|           |                 |                                         |                                             |

**4. DECLARATION**

I, THE UNDERSIGNED (NAME).....  
CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 2 and 3 ABOVE IS  
CORRECT. I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME  
SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....  
Signature

.....  
Date

.....  
Position

.....  
Name of bidder



MBD 5

DECLARATION FOR PROCUREMENT ABOVE R10 MILLION (ALL APPLICABLE TAXES INCLUDED)

For all procurement expected to exceed R10 million (all applicable taxes included), bidders must complete the following questionnaire:

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

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

**\*YES / NO**

.....

.....

2 Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days?

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

2.2 If yes, provide particulars.

.....

.....

.....

.....

\* Delete if not applicable

**\*YES / NO**



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

3.1 If yes, furnish particulars

.....

.....

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

4.1 If yes, furnish particulars

.....

.....

#### CERTIFICATION

I, THE UNDERSIGNED (NAME) .....

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT.

I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE

FALSE.

.....

Signature

.....

Date

.....

Position

.....

Name of Bidder



MBD 6.1

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

This preference form must form part of all bids invited. It contains general information and serves as a claim form for preference points for Broad-Based Black Economic Empowerment (B-BBEE) Status Level of Contribution

**NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF B-BBEE, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2022.**

**1. GENERAL CONDITIONS**

1.1 The following preference point systems are applicable to all bids:

- 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 a) The value of this bid is estimated to exceed/not exceed R50 000 000 (all applicable taxes included) and therefore the ..... preference point system shall be applicable; or  
b) Either the 80/20 or 90/10 preference point system will be applicable to this tender (*delete whichever is not applicable for this tender*)

1.3 Preference points for this bid shall be awarded for:

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

1.4 The maximum points for this bid are allocated as follows:

|                                                                  | POINTS     |
|------------------------------------------------------------------|------------|
| <b>PRICE</b>                                                     | <b>80</b>  |
| <b>SPECIFIC GOALS</b>                                            | <b>20</b>  |
| <b>Total points for Price and Specific Goals must not exceed</b> | <b>100</b> |

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). bid invitations, and includes all applicable taxes.

## 3. POINTS AWARDED FOR PRICE

### 3.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

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

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

Where

$P_s$  = Points scored for comparative price of bid under consideration

$P_t$  = Price of bid under consideration

$P_{\min}$  = Price of lowest acceptable bid

## 3. 4. POINTS AWARDED FOR SPECIFIC GOALS

- 3.1. 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:
- 3.2. 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)<br>(To be completed by the organ of state) | Number of points allocated (80/20 system)<br>(To be completed by the organ of state) | Number of points claimed (90/10 system)<br>(To be completed by the tenderer) | Number of points claimed (80/20 system)<br>(To be completed by the tenderer) |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |
|                                                             |                                                                                      |                                                                                      |                                                                              |                                                                              |

**8 DECLARATION WITH REGARD TO COMPANY/FIRM**

8.1 Name of company firm : .....

8.2 VAT registration number : .....

8.3 Company registration number : .....

8.4 TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One person business/sole propriety
- ☐ Close corporation
- ☐ Company
- ☐ (Pty) Limited

[TICK APPLICABLE BOX]

8.5 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

.....  
.....  
.....

8.6 COMPANY CLASSIFICATION

- ☐ Manufacturer
- ☐ Supplier
- ☐ Professional service provider
- ☐ Other service providers, e.g. transporter, etc.

[TICK APPLICABLE BOX]

8.7 MUNICIPAL INFORMATION

Municipality where business is situated .....

Registered Account Number .....

Stand Number:.....

8.8 Total number of years the company/firm has been in business: .....

8.9 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBE status level of contribution indicated in paragraphs 1.4 and 6.1 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we 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 paragraph 1.4 and 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;
- (iv) If the B-BBEE status level of contributor has been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have –
  - (a) disqualify the person from the bidding 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 bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury 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

**WITNESSES:**

1. ....

2. ....

.....  
SIGNATURE(S) OF BIDDER(S)

DATE:.....

ADDRESS:.....

.....

.....

.....

MBD 8

**DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT  
PRACTICES**

1. This Municipal Bidding Document must form part of all bids invited.
2. It serves as a declaration to be used by institutions in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.
3. The bid of any bidder may be disregarded if that bidder, or any of its directors have-
  - a) abused the institution's supply chain management system;
  - b) committed fraud or any other improper conduct in relation to such system; or
  - c) Failed to perform on any previous contract.
- 4 **In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.**

| Item  | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Yes                             | No                             |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------|
| 4.1   | Is the bidder or any of its directors listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector?<br><b>(Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the <i>audialterampartem</i> rule was applied)</b><br><br>The Database of Restricted Suppliers now resides on the National Treasury's website ( <a href="http://www.treasury.gov.za">www.treasury.gov.za</a> ) and can be accessed by clicking on its link at the bottom of the home page. | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |
| 4.1.1 | If so, furnish particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                 |                                |
| 4.2   | Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)?<br><br><b>The Register for Tender Defaulters can be accessed on the National Treasury's website (<a href="http://www.treasury.gov.za">www.treasury.gov.za</a>) by clicking on its link at the bottom of the home page.</b>                                                                                                                                                                                                                                                                       | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |
| 4.2.1 | If so, furnish particulars:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                 |                                |
| 4.3   | Was the bidder or any of its directors convicted by a court of law (including a court outside of the Republic of South Africa) for fraud or corruption during the past five years?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |
| 4.3.1 | If so, furnish particulars:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                 |                                |
| 4.4   | Was any contract between the bidder and any organ of state terminated during the past five years on account of failure to perform on or comply with the contract?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Yes<br><input type="checkbox"/> | No<br><input type="checkbox"/> |
| 4.4.1 | If so, furnish particulars:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                 |                                |

MBD 8

**CERTIFICATION**

I, THE UNDERSIGNED (FULL NAME)..... CERTIFY  
THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS TRUE AND CORRECT.

I ACCEPT THAT, IN ADDITION TO CANCELLATION OF A CONTRACT, ACTION MAY BE TAKEN  
AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....  
Signature

.....  
Date

.....  
Position

.....  
Name of Bidder

Js365bW

**MBD 9**

**CERTIFICATE OF INDEPENDENT BID DETERMINATION**

1. This Municipal Bidding Document (MBD) must form part of all bids<sup>1</sup> invited.
2. Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).<sup>2</sup> Collusive bidding is a per se prohibition meaning that it cannot be justified under any grounds.
3. Treasury Regulation 16A9 prescribes that accounting officers and accounting authorities must take all reasonable steps to prevent abuse of the supply chain management system and authorizes accounting officers and accounting authorities to:
  - a) disregard the bid of any bidder if that bidder, or any of its directors have abused the institution's supply chain management system and or committed fraud or any other improper conduct in relation to such system.
  - b) cancel a contract awarded to a supplier of goods and services if the supplier committed any corrupt or fraudulent act during the bidding process or the execution of that contract.
4. This MBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.
5. In order to give effect to the above, the attached Certificate of Bid Determination (MBD 9) must be completed and submitted with the bid:

<sup>1</sup> Includes price quotations, advertised competitive bids, limited bids and proposals.

<sup>2</sup> Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

MBD 9

**CERTIFICATE OF INDEPENDENT BID DETERMINATION**

I, the undersigned, in submitting the accompanying bid:

-----  
(Bid Number and Description)

in response to the invitation for the bid made by:

-----  
(Name of Institution)

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

I certify, on behalf  
of: \_\_\_\_\_ that:  
(Name of Bidder)

1. I have read and I understand the contents of this Certificate;
2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:
  - a) has been requested to submit a bid in response to this bid invitation; could potentially submit a bid in response to this bid invitation, based on
  - b) their qualifications, abilities or experience; and
  - c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder
6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium<sup>3</sup> will not be construed as collusive bidding.
7. In particular, without limiting the generality of paragraphs 6 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
  - a) prices;
  - b) geographical area where product or service will be rendered (market allocation)
  - c) methods, factors or formulas used to calculate prices;
  - d) the intention or decision to submit or not to submit, a bid;

- e) the submission of a bid which does not meet the specifications and conditions of the bid; or
  - f) bidding with the intention not to win the bid.
8. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this bid invitation relates.
9. The terms of the accompanying bid have not been, and will not be, disclosed by the tenderers, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

<sup>3</sup> 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.

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

.....  
Signature Date

.....  
Position Name of Bidder

## **PART C1**

# **AGREEMENT AND CONTRACT DATA**

**C1 AGREEMENT AND CONTRACT DATA**

**C1.1 FORM OF OFFER AND ACCEPTANCE**

**OFFER**

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

**Project Name: RETROFITTING OF 6 sewer pump stations , INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

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:**

.....

.....Rands (in words);

R..... (in figures)

This offer may be accepted by the Employer by signing the acceptance part of this form of offer and acceptance and returning one copy of this document to the tenderer before the end of the period of validity stated in the Tender Data, whereupon the tenderer becomes the party named as the contractor in the Conditions of Contract identified in the Contract Data.

Signature .....

Date .....

Name .....

Capacity .....

**FOR THE TENDERER**

(Name and address of organization) .....

Name and signature of witness .....

.....



## ACCEPTANCE

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

**Part C1:** Agreements and Contract Data, (which includes this agreement)

**Part C2:** Pricing data

**Part C3:** Scope of work.

**Part C4:** Site information

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

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

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

Signature ..... Date .....

Name .....

Capacity .....

## FOR THE EMPLOYER

Name and signature of witness .....

.....

Date .....

Schedule of Deviations (To be filled in if there are any Deviations or Alternatives accepted)

1. Subject : \_\_\_\_\_

Details : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. Subject : \_\_\_\_\_

Details : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Subject : \_\_\_\_\_

Details : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Subject : \_\_\_\_\_

Details : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5. Subject : \_\_\_\_\_

Details : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

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

(To be signed only if there are any Deviations listed above)

Signature ..... Date .....

Name .....

Capacity .....

**FOR THE TENDERER**

(Name and address of organization) .....

Name and signature of witness .....

.....

Date .....

Signature .....

Date .....

Name .....

Capacity .....

**FOR THE EMPLOYER**

Name and signature of witness .....

.....

Date .....

## **C1.2 CONTRACT DATA**

The General Conditions of Contract for Construction Works (2010) published by the South African Institution of Civil Engineering, Second Edition, Print 3.1, is applicable to this contract.

Copies of these General Conditions of Contract may be obtained from the South African Institution of Civil Engineering:

Block 19, Thornhill Office Park  
Bekker Street, Vorna Valley,  
Midrand.

Private Bag X200,  
Halfway House. 1685

Tel: 011-805 5947

Fax: 011-805 5971

### **C1.2.1 CONTRACT SPECIFIC DATA.**

The following contracts data are applicable to this contract:

| <b>REFERENCE TO:</b>                                  | <b>CLAUSE.</b> | <b>DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contractor.                                           | 1.1.1.9        | To be appointed by Tswelopele Local Municipality                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Defect liability Period                               | 1.1.1.13       | The defect liability period shall be 12 months. This includes 4 comprehensive maintenance visits on the works.                                                                                                                                                                                                                                                                                                                                                                              |
| Due Completion Date                                   | 1.1.1.14       | The Works shall be completed within <b>4 months</b> Excluding year-end holiday as envisaged by the employer.                                                                                                                                                                                                                                                                                                                                                                                |
| Employer.                                             | 1.1.1.15       | Tswelopele Local Municipality                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Contract Cessions                                     | 5.1            | Contract Cessions will be approved by the Employer on this Project                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Sub-Contracting                                       | 4.4            | The appointed contractor will go out on tender to appoint <b>local sub contractors with CIDB grading of 2 or 3 CE/GB/ME. The main contractor will allocate works worth 3 or 4 CE/GB/ME</b> to the local sub contractor and will be required to assist the local contractor to upgrade their grading and as well as mentor the contractor throughout construction. This requirement will be added as an item on the bill to ensure effective implementation of local contractor development. |
| Documentation Required Before Commencement with Works | 5.3.1          | The Works are to be commenced within twenty one (21) days of the Commencement Date. The documents required before commencement with the Works execution are: <ul style="list-style-type: none"> <li>• Initial Programme (clause 5.6);</li> <li>• Insurance (clause 8.6); and</li> <li>• Health and safety plan (clause 4.3);</li> </ul>                                                                                                                                                     |
| Submission of documents required in clause 5.3.1      | 5.3.2          | The time to submit the documentation required before commencement with the Works execution is 21 days.                                                                                                                                                                                                                                                                                                                                                                                      |

**RETROFITTING OF 6 sewer pump stations , INSTALLATION OF  
INLINE GRINDERS AND REPAIRS TO WASTE WATER  
TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

**AGREEMENT AND CONTRACT DATA**

| REFERENCE TO:                    | CLAUSE.          | DATA                                                                                 |
|----------------------------------|------------------|--------------------------------------------------------------------------------------|
| Special Non-working days         | 5.8.1            | The special non-working days are public holidays                                     |
| Penalty for delay                | 5.13.1           | 0.05% of the contract value per day                                                  |
| Liability for any Latent Defects | 5.16.3           | The latent defect period is 10 years.                                                |
| Contract Guarantee               | 6.2.3            | Within 14 days after appointment letter has been issued.                             |
| Guarantee Sum                    | 6.2.1/6.2.2      | 10% of the Contract Value                                                            |
| Percentage Allowances            | 6.5.1.2.3        | The percentage allowances shall be 7%.                                               |
| Time for Completion              | 5.6.2.1          | 4 months from Commencement Date EXCLUDING YEAR<br>END BREAK                          |
| Contract Price Adjustment        | 6.8.2            | Refer to Page <b>T2.2-51</b> on price adjustments formula<br>applicable.             |
| Special Material                 | 6.8.3            | There are no special materials in this contract.                                     |
| Dispute Resolution               | 10.5.1<br>10.5.3 | Adjudication or arbitration and the court will be acceptable<br>to resolve disputes. |

.....

Signature

.....

Date

.....

Position

.....

Name of bidder

**C1.2.2 DATA PROVIDED BY THE CONTRACTOR**

Clause 6.8.3 of the GCC:

| Special Materials | Unit on which variation will be determined* | Price (ex-factory) for the base month (exc. Vat)** |
|-------------------|---------------------------------------------|----------------------------------------------------|
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |
|                   |                                             |                                                    |

Notes:

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

\*\* The price for special materials is only the price for the material ex-factory and does not include the cost of transport, labour or any other costs. When called upon to do so, the tenderer shall substantiate the above prices with acceptable documentary evidence for the base month and the month in which the increase is claimed.

.....

Signature

.....

Date

.....

Position

.....

Name of bidder

**C1.2.3 EPWP SPECIFIC CONDITIONS OF CONTRACT.**

**NOTE THAT THIS PROJECT HAS NOT BEEN REGISTERED AS AN EPWP PROJECT, BUT WILL BE EXECUTED ACCORDING TO THE EPWP PRINCIPLES, SAVE FOR THE HOURLY LABOUR RATES WHICH SHALL BE AS PER THE CIVIL ENGINEERING WORKS DETERMINATION, GOVERNMENT GAZETTE 35634 OF 28 AUGUST 2012, AS REVISED FROM TIME TO TIME, AND WHICH LATEST REVISION SHALL APPLY FOR THIS PROJECT. THE LABOUR RATES REFERRED TO IN THIS PARAGRAPH SHALL SUPERSEDE ALL OTHER RATES THAT MAY BE DIRECTLY OR INDIRECTLY INFERRED FROM OTHER SECTIONS AND PARAGRAPHS OF THIS DOCUMENT.**

**Payment for the labour-intensive component of the works**

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

**Applicable labour laws**

The Ministerial Determination, Extended Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice N° R63 of 25 January 2002, as reproduced below, shall apply to works described in the scope of work as being labour intensive and which are undertaken by unskilled or semi-skilled workers.

**1. Introduction**

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

1.2 In this document –

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

**2. Terms of Work**

2.1 Workers on an EPWP are employed on a temporary basis.



- 2.2 A worker may NOT be employed for longer than 24 months in any five-year cycle on an EPWP
- 2.3 Employment on an EPWP does not qualify as employment as a contributor for the purposes of the Unemployment Insurance Act 30 of 1966.

**3. Normal Hours of Work**

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

**4 Meal Breaks**

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

**5 Special Conditions for Security Guards**

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

**6 Daily Rest Period**

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

**7 Weekly Rest Period**

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

**8 Work on Sundays and Public Holidays**

- 8.1 A worker may only work on a Sunday or public holiday to perform emergency or security work.

8.2 Work on Sundays is paid at the ordinary rate of pay.

8.3 A task-rated worker who works on a public holiday must be paid –

- (a) The worker's daily task rate, if the worker works for less than four hours;
- (b) Double the worker's daily task rate, if the worker works for more than four hours.

8.4 A time-rated worker who works on a public holiday must be paid –

- (a) The worker's daily rate of pay, if the worker works for less than four hours on the public holiday
- (b) Double the worker's daily rate of pay, if the worker works for more than four hours on the public holiday.

## **9 Sick Leave**

9.1 Only workers who work four or more days per week have the right to claim sick pay in terms of this clause.

9.2 A worker who is unable to work on account of illness or injury is entitled to claim one day's paid sick leave for every full month that the worker has worked in terms of a contract.

9.3 A worker may accumulate a maximum of twelve days' sick leave in a year.

9.4 Accumulated sick-leave may not be transferred from one contract to another contract.

9.5 An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.

9.6 An employer must pay a time-rated worker the worker's daily rate of pay for a day's sick leave.

9.7 An employer must pay a worker sick pay on the worker's usual payday.

9.8 Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is –

- (a) Absent from work for more than two consecutive days; or
- (b) Absent from work on more than two occasions in any eight-week period.

9.9 A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorised to issue medical certificates indicating the duration and reason for incapacity.

9.10 A worker is not entitled to paid sick-leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational Injuries and Diseases Act.

## **10 Maternity Leave**

10.1 A worker may take up to four consecutive months' unpaid maternity leave.

10.2 A worker is not entitled to any payment or employment-related benefits during maternity leave.

- 10.3 A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.
- 10.4 A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.
- 10.5 A worker may begin maternity leave –
- (a) four weeks before the expected date of birth; or
  - (b) On an earlier date –
    - (i) If a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or
    - (ii) If agreed to between employer and worker; or
  - (c) On a later date, if a medical practitioner, midwife or certified nurse has certified that the worker is able to continue to work without endangering her health.
- 10.6 A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.
- 10.7 A worker who returns to work after maternity leave, has the right to start a new cycle of twenty-four months employment, unless the EPWP on which she was employed has ended.

## **11 Family responsibility leave**

- 11.1 Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances -
- (a) when the employee's child is born;
  - (b) when the employee's child is sick;
  - (c) in the event of a death of –
    - (i) the employee's spouse or life partner;
    - (ii) the employee's parent, adoptive parent, grandparent, child, adopted child, grandchild or sibling.

## **12 Statement of Conditions**

- 12.1 An employer must give a worker a statement containing the following details at the start of employment
- (a) the employer's name and address and the name of the EPWP;
  - (b) the tasks or job that the worker is to perform; and
  - (c) the period for which the worker is hired or, if this is not certain, the expected duration of the contract;
  - (d) the worker's rate of pay and how this is to be calculated;
  - (e) the training that the worker will receive during the EPWP.

12.2 An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement.

12.3 An employer must supply each worker with a copy of these conditions of employment.

### **13 Keeping Records**

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

- (a) the worker's name and position;
- (b) in the case of a task-rated worker, the number of tasks completed by the worker;
- (c) in the case of a time-rated worker, the time worked by the worker;
- (d) Payments made to each worker.

13.2 The employer must keep this record for a period of at least three years after the completion of the EPWP.

### **14 Payment**

14.1 An employer must pay all wages at least monthly in cash or by cheque or into a bank account.

14.2 A task-rated worker will only be paid for tasks that have been completed.

14.3 An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer.

14.4 A time-rated worker will be paid at the end of each month.

14.5 Payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.

14.6 Payment in cash or by cheque must take place –

- (a) at the workplace or at a place agreed to by the worker;
- (b) during the worker's working hours or within fifteen minutes of the start or finish of work;
- (b) in a sealed envelope which becomes the property of the worker.

14.7 An employer must give a worker the following information in writing –

- (a) the period for which payment is made;
- (b) the numbers of tasks completed or hours worked;
- (c) the worker's earnings;
- (d) any money deducted from the payment;
- (e) the actual amount paid to the worker.

14.8 If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it.

- 14.9 If a worker's employment is terminated, the employer must pay all monies owing to that worker within one month of the termination of employment.

## **15 Deductions**

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

## **16 Health and Safety**

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

## **17 Compensation for Injuries and Diseases**

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

## **18 Termination**

- 18.1 The employer may terminate the employment of a worker for good cause after following a fair procedure.
- 18.2 A worker will not receive severance pay on termination.
- 18.3 A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.
- 18.4 A worker who is absent for more than three consecutive days without informing the employer of an intention to return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.
- 18.5 A worker who does not attend required training events, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

**19 Certificate of Service**

- 19.1 On termination of employment, a worker is entitled to a certificate stating –
- (a) the worker's full name;
  - (b) the name and address of the employer;
  - (c) the EPWP on which the worker worked;
  - (d) the work performed by the worker;
  - (e) any training received by the worker as part of the EPWP;
  - (f) the period for which the worker worked on the EPWP;
  - (g) any other information agreed on by the employer and worker.

**C1.3 BLASTING INDEMNITY**

Contract No.

Given by \_\_\_\_\_

\*Company Registration No. \_\_\_\_\_

Address \_\_\_\_\_

a \*Company incorporated with limited liability according to the company laws of the Republic of South Africa,  
\*Partnership, \*Close Corporation, \*Public Company (hereinafter called the Contractor), represented herein  
by \_\_\_\_\_ in his capacity as the Contractor's  
\_\_\_\_\_ duly authorised hereto by a resolution of the Contractor  
dated \_\_\_\_\_ a certified copy of which resolution is attached to this  
Indemnity.

WHEREAS the Contractor has entered into a Contract with the **Tswelopele Local Municipality** (hereinafter  
called the Company) for,

\_\_\_\_\_ and the Company requires this Indemnity from the Contractor

NOW THEREFORE THIS DEED WITNESSETH that the Contractor does hereby indemnify and hold  
harmless the Company in respect of all loss or damage that may be incurred or sustained by the Company  
by reason of or in any way arising out of or caused by blasting operations that may be carried out by the  
Contractor in connection with the aforementioned Contract and also in respect of all claims that may be made  
against the Company in consequence of such blasting operations, by reason of or in any way arising out of  
any accidents or damage to persons, life or property or any other cause whatsoever, and also in respect of  
all legal or other expenses that may be incurred by the Company in examining, resisting or settling any such  
claims; for the due performance of which the Contractor binds itself according to law.

THUS DONE AND SIGNED for and on behalf of the Contractor at \_\_\_\_\_ on the  
\_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_ in the presence of the subscribing  
witnesses.

AS WITNESSES

1. \_\_\_\_\_  
SIGNATURE

2. \_\_\_\_\_  
DESIGNATION OF SIGNATORY

\*Delete which does not apply

**C1.4 HEALTH AND SAFETY CONTRACT: GENERAL INFORMATION**

1. The Occupational Health and Safety Act comprises Sections 1 to 50 and all un-repealed regulations promulgated in terms of the former Machinery and Occupational Safety Act No 6 of 1983 as amended, as well as other regulations which may be promulgated in terms of the OHS Act.
2. 'Mandatory' is defined as including an agent, a contractor or a subcontractor for work, but without derogating from his status in his own right as an employer or user of plant and machinery.
3. Section 37 of the Occupational Health and Safety Act potentially punishes employers (principals) for the unlawful acts or omissions of mandataries (contractors) save where a written agreement between the parties has been concluded containing arrangements and procedures to ensure compliance with the said Act by the mandatory.
4. All documents attached or referred to in the above agreement form an integral part of the agreement.
5. To perform in terms of this agreement mandataries must be familiar with the relevant provisions of the Act.
6. Mandataries who utilise the services of their own mandataries (subcontractors) are advised to conclude a similar written agreement.
7. Be advised that this agreement places the onus on the mandatory to contact the employer in the event of inability to perform as per this agreement. The employer, however, reserves the right to unilaterally take any steps as may be necessary to enforce this agreement.
8. The contractor shall be responsible for the full and proper implementation of the terms and provisions of the Act and its regulations in the area in which the work is to be undertaken by the contractor.
9. The contractor shall be responsible for the well-being, in relation to health and safety, of all persons coming upon or into such area in accordance with that legislation, including the implementation of any directives issued by management of Tswelopele Local Municipality in this respect.
10. The work to be done is \_\_\_\_\_
11. The area in which the work is to be conducted is \_\_\_\_\_
12. The contractor shall familiarise himself with such area and all risks existing thereon and undertakes to report to the representative of Tswelopele Local Municipality any hazard or risk to health and safety which arises during the contract work in the area concerned and over which the contractor may have no control. All necessary and appropriate safety / health equipment shall be issued by the contractor to all persons working on or coming into the area.



**C1.4.1 HEALTH AND SAFETY CONTRACT BETWEEN EMPLOYER AND CONTRACTOR IN  
TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT  
NO 85 OF 1993.**

Written agreement between Tswelopele Local Municipality (hereinafter referred to as "the Employer")  
and \_\_\_\_\_ (hereinafter referred to as "the  
mandatory") as envisaged by Section 37(2) of the Occupational Health and Safety Act, No. 85, of 1993  
as amended.

I \_\_\_\_\_ representing  
\_\_\_\_\_ (mandatory) do hereby acknowledge that  
\_\_\_\_\_ (mandatory) is an employer in its own right and shall  
be regarded as the employer for purposes of the contract work specified in the body of the principal  
agreement with duties as prescribed in the Occupational Health and Safety Act, No. 85 of 1993 as  
amended so as to ensure that all work will be performed or machinery and plant used in accordance  
with the provisions of the said Act. I furthermore agree to comply with the requirements of the Employer  
as contained in the Occupational Health and Safety Specification included with the principal agreement  
and to liaise with the employer should I, for whatever reason, be unable to perform in terms of this  
agreement.

Signed this \_\_\_\_\_ day of \_\_\_\_\_ at \_\_\_\_\_

Signature on behalf of mandatory  
\_\_\_\_\_

Signature on behalf of Employer  
\_\_\_\_\_

**Compensation Fund Registration No. of mandatory**  
\_\_\_\_\_

Good Standing Certificate : ☐ yes ☐ no (tick one box)

**C1.4.2 OCCUPATIONAL HEALTH AND SAFETY INDEMNITY UNDERTAKING**

I, the undersigned: \_\_\_\_\_

in my capacity as: \_\_\_\_\_

of the firm: \_\_\_\_\_

- 1.0 hereby undertake to ensure that I/my firm and/or employees and/or subcontractors and/or his employees -
- 1.1 comply strictly with the provisions of the Occupational Health and Safety Act of 1993 (as amended) and/or the regulations promulgated in terms thereof, with specific reference to section 37(2) of the said act, as well as any relevant legislation, in the course of the performance/execution of any service and/or work in, to or on any Tswelopele Local Municipality buildings, construction sites and/or premises;
- 1.2 ensure that consultants and/or visitors comply with any instructions and measures relating to occupational health and safety, as prescribed by Tswelopele Local Municipality; and
- 1.3 comply strictly with the statutorily prescribed work systems, operational equipment, machinery and occupational health and safety conditions;
- 2.0 and as an independent employer and contractor, hereby indemnify, in terms of the above undertakings, Tswelopele Local Municipality -
- 2.1 in respect of any costs that I/my firm and/or employees and/or subcontractors and their employees may incur of necessity in compliance with the above undertakings; and
- 2.2 against any claims that may be instituted against Tswelopele Local Municipality and/or any liability that Tswelopele Local Municipality may incur, whether instituted and/or caused by me/my firm's employees, agents, consultants, subcontractors and/or their employees and visitors or Tswelopele Local Municipality clients or neighbours in respect of any incidents related to my/my firm's activities and as a result of which the occupational health and safety of the persons involved have been detrimentally affected; and
- 2.3 against similar claims that I, managers or directors of my firm may have against Tswelopele Local Municipality and any damages for which I, managers or directors of my firm hold Tswelopele Local Municipality liable.
- 3.0 My firm's compensation commissioner number is and I confirm that my firm and its subcontractors' fees have been paid up and obligations in respect of the compensation commissioner have been complied with and further that I shall furnish proof thereof in writing on request.
- 4.0 I hereby confirm that I have the authority to sign this indemnity undertaking and that Tswelopele Local Municipality is not obliged to confirm such confirmation.

Signed at \_\_\_\_\_ this \_\_\_\_\_ day

Of \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Capacity

As witnesses:

1 \_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

2 \_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

#### C1.5 INCLEMENT WEATHER

No extension of time for completion will be granted on account of normal inclement weather but extension of time shall be determined for abnormal rainfall or wet conditions. The extension request must be in accordance with the formula given below, separately for each calendar month or part thereof. It shall be calculated for the period from the Commencement Date to the Due Completion Date or the date of issue of the Certificate of Practical Completion, whichever is earlier, and excluding the Contractor's year-end recess.

$$V = (N_w - N_n) + (R_w - R_n) / X$$

The symbols shall have the following meanings:

**V** = Extension of time in calendar days in respect of the calendar month under consideration.

**N<sub>w</sub>** = Actual number of days during the relevant calendar month on which Y mm or more of rainfall has been recorded.

**N<sub>n</sub>** = Average number of days in the relevant calendar month on which Y mm or more of rainfall has been recorded, as derived from the rainfall records provided in the Project Specification.

**R<sub>w</sub>** = Actual rainfall in mm for the calendar month under consideration.

**R<sub>n</sub>** = Average rainfall in mm for the relevant calendar month, as derived from the rainfall records provided in the Project Specifications.

If V is negative and its absolute value exceeds N<sub>n</sub>, then V shall be taken as equal to minus N<sub>n</sub>.

For this Contract, X and Y shall have the following values:

X = 20 mm/d                      Y = 10 mm

Extensions of time for part of a month shall be calculated using pro rata values of N<sub>n</sub> and R<sub>n</sub>.

The total extension of time shall be the algebraic sum of the monthly totals for the period under consideration, but if the grand total is negative the time for completion shall not be reduced due to abnormal rainfall.

The factor (N<sub>w</sub> - N<sub>n</sub>) shall be considered to represent a fair allowance for variations from the average number of days during which rainfall exceeds Y mm.

The factor (R<sub>w</sub> - R<sub>n</sub>)/X shall be considered to represent a fair allowance for variations from the average in the number of days during which rainfall does not exceed Y mm but wet conditions prevented or disrupted work.

The formula does not take account of flood damage, which could cause further or concurrent delays, which shall be treated separately as far as extension of time is concerned.

Rainfall records of the nearest weather station can be obtained from South African Weather Services.

## **PART C2**

## **PRICING DATA**

**C2 PRICING DATA**

**C2.1 PRICING INSTRUCTIONS**

1. Measurement and payment shall be in accordance with the relevant provisions of the SANS Standard Specification, The General Conditions of Contract, the Contract Data, the Scope of Work (including the Specifications), the Site Information and the Drawings are to be read in conjunction with the Bill of Quantities

2. The units of measurement described in the Bill of Quantities are metric units. Abbreviations used in the Bill of Quantities are as follows:

|                      |   |                       |
|----------------------|---|-----------------------|
| %                    | = | percent               |
| h                    | = | hour                  |
| ha                   | = | hectare               |
| kg                   | = | kilogram              |
| kl                   | = | kilolitre             |
| km                   | = | kilometer             |
| km-pass              | = | kilometre-pass        |
| kPa                  | = | kilopascal            |
| kW                   | = | kilowatt              |
| l                    | = | liter                 |
| m                    | = | meter                 |
| mm                   | = | millimeter            |
| m <sup>2</sup>       | = | square meter          |
| m <sup>2</sup> -pass | = | square meter-pass     |
| m <sup>3</sup>       | = | cubic meter           |
| m <sup>3</sup> -km   | = | cubic meter-kilometer |
| MN                   | = | meganewton            |
| MN.m                 | = | meganewton-meter      |
| MPa                  | = | megapascal            |
| No.                  | = | number                |
| Prov sum             | = | Provisional sum       |
| PC sum               | = | Prime Cost sum        |
| R/only               | = | Rate only             |
| sum                  | = | lump sum              |
| t                    | = | ton (1000 kg)         |
| W/day                | = | Work day              |

3. For the purpose of the Bill of Quantities, the following words shall have the meanings hereby assigned to them:

Unit: The unit of measurement for each item of work as defined in the SANS Standard Specification, The General Conditions of Contract, the Contract Data, the Scope of Work (including the Specifications).

Quantity: The number of units of work for each item.

Rate: The payment per unit of work at which the Tenderer tenders to do the work..

Amount: The product of the quantity and the rate tendered for an item.

Lump sum: An amount tendered for an item, the extent of which is described in the Bill of Quantities, the Specifications or elsewhere but of which the quantity of work is not measured in units.

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

5. It will be assumed that prices included in the Bill of Quantities are based on Acts, Ordinances,

Regulations, By-laws, International Standards and National Standards that were published 28 days before the closing date for tenders. (Refer to [www.stanza.org.za](http://www.stanza.org.za) or [www.iso.org](http://www.iso.org) for information on standards)

6. The prices and rates in the Bill of Quantities are fully inclusive prices for the work described under the items. Such prices and rates cover all costs and expenses that may be required in and for the execution of the Works described in accordance with the provisions of the Scope of Work, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the Contract Data, as well as overhead charges and profit. These prices will be used as a basis for assessment of payment for additional work that may have to be carried out.
7. Where the Scope of Work requires detailed drawings and designs or other information to be provided, all costs associated therewith are deemed to have been provided for and included in the unit rates and sum amounts tendered under such items.
8. An item against which no price is entered will be considered to be covered by the other prices or rates in the Bill of Quantities. A single lump sum will apply should a number of items be grouped together for pricing purposes.
9. The quantities set out in the Bill of Quantities are approximate and do not necessarily represent the actual amount of work to be done. The quantities of work accepted and certified for payment will be used for determining payments due and not the quantities given in the Bill of Quantities.
10. The short descriptions of the items of payment given in the Bill of Quantities are only for the purposes of identifying the items. More details regarding the extent of the work entailed under each item appear in the Scope of Work.
11. The item numbers appearing in the Bill of Quantities refer to the corresponding item numbers in the SABS 1200 applicable specification. The work scheduled payment should be referred to the applicable payment items in SABS 1200, which must receive preference to the reference given in the Schedule of Quantities or if any such reference is not indicated.
12. Those parts of the contract to be constructed using labour-intensive methods have been marked in the Bill of Quantities with the letters LI in a separate column filled in against every item so designated. The works, or parts of the Works so designated are to be constructed using labour-intensive methods only. The use of plant to provide such Works, other than plant specifically provided for in the Scope of Work, is a variation to the contract. The items marked with the letters LI are not necessarily an exhaustive list of all the activities which must be done by hand, and this clause does not over-ride any of the requirements in the generic labour intensive specification in the Scope of Works.
13. Payment for items, which are designated to be constructed labour-intensively (either in this schedule or in the Scope of Works), will not be made unless they are constructed using labour-intensive methods. Any unauthorised use of plant to carry out work which was to be done labour-intensively will not be condoned and any works so constructed will not be certified for payment.

**C2.2 BILL OF QUANTITIES**

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER  
TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

**SUMMARY OF SECTIONS**

|                       |                           |   |   |
|-----------------------|---------------------------|---|---|
| SECTION 1             | PRELIMINARY AND GENERAL   | R | - |
| SECTION 2             | MECHANICAL - PUMP STATION | R | - |
| SECTION 3             | ELECTRICAL - PUMP STATION | R | - |
| SECTION 4             | CIVIL AND STRUCTURAL      | R | - |
|                       |                           |   |   |
| SUB TOTAL 1           |                           | R | - |
| 10% CONTINGENCIES     |                           | R | - |
|                       |                           |   |   |
| SUB TOTAL 2           |                           | R | - |
| 15% VAT               |                           | R | - |
|                       |                           |   |   |
| TENDER SUM (incl VAT) |                           | R | - |

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| SECTION 1: PRELIMINARY AND GENERAL |              |                                                                                                                                                             |        |          |      |        |
|------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|------|--------|
| ITEM                               | PAYMENT      | DESCRIPTION                                                                                                                                                 | UNIT   | QUANTITY | RATE | AMOUNT |
| 1.1                                | SANS<br>1200 | <b><u>SECTION A: PRELIMINARY AND GENERAL</u></b><br><br><b>FIXED-CHARGE AND VALUE RELATED ITEMS</b>                                                         |        |          |      |        |
| 1.1.1                              |              | Contractual Requirements                                                                                                                                    | Sum    | 1        |      |        |
| 1.1.2                              |              | Establishment of Facilities on the Site                                                                                                                     |        |          |      |        |
| 1.1.2.1                            |              | Offices and storage sheds                                                                                                                                   | Sum    | 1        |      |        |
| 1.1.2.2                            |              | Workers accommodation and transport                                                                                                                         | Sum    | 1        |      |        |
| 1.1.2.3                            |              | Ablution and latrine facilities                                                                                                                             | Sum    | 1        |      |        |
| 1.1.2.4                            |              | Tools and equipment                                                                                                                                         | Sum    | 1        |      |        |
| 1.1.2.5                            |              | Water, electrical and telecommunication connection                                                                                                          | Sum    | 1        |      |        |
| 1.1.2.6                            |              | Dealing with water                                                                                                                                          | Sum    | 1        |      |        |
| 1.1.2.7                            |              | Standby power                                                                                                                                               | Sum    | 1        |      |        |
| 1.1.2.8                            |              | Plant & Machinery                                                                                                                                           | Sum    | 1        |      |        |
| 1.1.2.9                            |              | Other fixed-charge obligations (Tenderer to specify) High Pressure unit                                                                                     | Sum    | 1        |      |        |
| 1.1.2.10                           |              | Site de-establishment and rehabilitation                                                                                                                    | Sum    | 1        |      |        |
| 1.1.2.11                           |              | Nameboard                                                                                                                                                   | Sum    | 1        |      |        |
| 1.2                                |              | <b><u>COMPLIANCE WITH OHS ACT AND REGULATIONS (INCLUDING THE CONSTRUCTION REGULATIONS 2003).</u></b><br><b>Cost breakdown to be provided in the tender.</b> | Sum    | 1        |      |        |
| 1.3                                |              | <b>TIME RELATED ITEMS</b>                                                                                                                                   |        |          |      |        |
| 1.3.1                              |              | Contractual Requirements                                                                                                                                    | Months | 6        |      |        |
| 1.3.2                              |              | Operation and maintenance of site facilities                                                                                                                | Months | 6        |      |        |
| <b>TOTAL CARRIED FORWARD</b>       |              |                                                                                                                                                             |        |          |      |        |

| ITEM                            | PAYMENT | DESCRIPTION                                                                       | UNIT           | QUANTITY  | AMOUNT |
|---------------------------------|---------|-----------------------------------------------------------------------------------|----------------|-----------|--------|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                   |                |           | -      |
| 1.3.3                           |         | Site Supervision and construction management                                      | Months         | 6         |        |
| 1.3.4                           |         | Company and Head Office overhead costs<br>for the duration of the contract        | Months         | 6         |        |
| 1.3.5                           |         | Community Liaison Officer                                                         | Prov<br>Sum    | 1         |        |
| 1.3.6                           |         | Student                                                                           | Months         | 6         |        |
| 1.3.7                           |         | Site security                                                                     | Months         | 6         |        |
| 1.3.8                           |         | Accommodation & LOA                                                               | Months         | 6         |        |
| 1.3.9                           |         | Other time related charge obligations (tenderer<br>to specify)                    | Months         | 6         |        |
| 1.3.10                          |         | Communication for the Engineer (Prov)                                             | Month          | 6,00      |        |
| 1.3.11                          |         | Profit on item (1.3.11) on above                                                  | %              | 12 000,00 |        |
| 1.3.12                          |         | Supply or Hire of specialised equipment for<br>the detection of existing services | Prov<br>Sum    | 1         |        |
| 1.3.13                          |         | Accommodation of traffic                                                          | Prov<br>Sum    | 1         |        |
| 1.3.14                          |         | Relocation of existing services                                                   | Prov<br>Sum    | 1         |        |
| 1.3.15                          |         | Excavation by hand to expose existing<br>services                                 | m <sup>3</sup> | 100       |        |
|                                 |         | Shop/ Workshop drawings for all stations and<br>WWTW equipment                    | Sum            | 1         |        |
|                                 |         | Decommissioning of old equipment in all stations<br>and WWTW                      | Sum            | 1         |        |
|                                 |         | Dewatering of all sumps during construction                                       | Sum            | 1         |        |
| 1.4                             |         | <b>TRAINING SKILLS AND DEVELOPMENT</b>                                            | Prov<br>Sum    | 1         |        |
| 1.5                             |         | <b>LOCAL CONTRACTOR DEVELOPMENT<br/>MANAGEMENT</b>                                | Months         | 6         |        |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                   |                |           |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| SECTION 2: MECHANICAL - PUMP STATION |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |          |      |        |
|--------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|------|--------|
| ITEM                                 |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | UNIT | QUANTITY | RATE | AMOUNT |
| 2                                    |  | <b>MECHANICAL WORKS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |          |      |        |
| 2.1                                  |  | <b>HOOPSTAD COMMANDO PUMP STATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |          |      |        |
|                                      |  | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |          |      |        |
| 2.1.1                                |  | <b>PUMPS SETS, GUAGES &amp; FITTINGS</b><br><i>Supply, delivery, installation, testing and commissioning of pumps, pipework, fittings, bends, elbows, reducers and other listed installations, complete with flanges, gaskets, bolts, nuts and washers, All Flanges to be SANS 1123.Refer to Pipe schedule in the drawings book.</i><br><br><i>Hidrostal screw-centrifugal or similar approved</i><br>New submersible raw-sewage pump sets with (one duty and the other standby), Duckfoot type with guide rail.<br>Suitable for pumping of wastewater and sewage.<br>Water-pressure tight, encapsulated, IP68 flood-proof motor and X20Cr13 stainless steel shaft.<br>Bimetal switch for thermal protection and conductivity probe for early detection of moisture ingress in seal chamber.<br>duties: 14.4 l/s (51.84 m3/h) at a head of 13.97 metres<br>It is essential to read through the specifications and to understand the system curves, when pricing.<br>and Hydraulic efficiency shall be at least 59%. <i>The engineer shall give prior approval before a purchase order is placed.</i> | No   | 2        |      |        |
|                                      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      | INCL     |      |        |
| <b>TOTAL CARRIED FORWARD</b>         |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |          |      |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                         | UNIT | QUANTITY |  |   |
|------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|---|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                     |      |          |  | - |
| 2.1.2                        |  | Motor 380V - 420V, 50Hz, 4-pole, IE3, efficiency IP68, 3.5 kW at 1450 rpm;<br>Continuous running duty; Class H insulation;<br>PT100 probes for windings temperature.                                                                                                                                                                |      | INCL     |  |   |
| <b>2.1.3</b>                 |  | <b>PIPING &amp; VALVES</b>                                                                                                                                                                                                                                                                                                          |      |          |  |   |
| 2.1.3.1                      |  | Suction pipe, HDPE,<br>200 NB, with a wall thickness of<br><br>6mm, complete with specials, flanges,<br>puddle flanges, fittings and VJ coupling,<br>crotch plate, FBE to 150 microns, and<br>painting, complete with fittings (Pipe<br>Reducers and bends) and suction<br>bellmouth (with baffles), and installed into<br>forebay. | m    | 15       |  |   |
| 2.1.3.2                      |  | Delivery pipe, HDPE<br>160 NB, complete with specials,<br>flanges, fittings and VJ coupling, crotch<br>plate, FBE to 150 microns, and painting,<br>complete with fittings (pipe reducers and<br>bends) connecting into main delivery<br>manifold.                                                                                   | m    | 20       |  |   |
| 2.1.3.3                      |  | Resilient gate valve, rising stem, <b>Suction</b><br>side : <b>200 NB, PN10</b> , flanged to SABS 1123                                                                                                                                                                                                                              | No.  | 2        |  |   |
| 2.1.3.4                      |  | Resilient gate valve metal, rising stem,<br><b>Delivery</b> side : <b>160 NB, PN16</b> , flanged to<br>SABS 1123                                                                                                                                                                                                                    | No.  | 3        |  |   |
| 2.1.3.5                      |  | Non-return valve, <b>160 NB, PN25</b> , tilted disc<br>type with an operating stroke of not more<br>than 40°, flanged to SABS 1123                                                                                                                                                                                                  | No.  | 2        |  |   |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                     |      |          |  |   |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS**

| TO WASTE WATER TREATMENT PLANT IN HOORSTAD AND TIKWANA |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |  |  |
|--------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| ITEM                                                   |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | UNIT | QUANTITY |  |  |
| <b>TOTAL BROUGHT FORWARD</b>                           |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |  |  |
| <b>2.1.4</b>                                           |  | <b>DEWATERING PUMP</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |          |  |  |
| 2.1.4.1                                                |  | Hidrostal compact submersible pump set or similar approved (pump and motor systems) for the de-watering of the pump chamber each with a capacity of 10.1 l/s at a head of 10.28 metres at a hydraulic efficiency of at least 60%.<br>1.8kW, 400V, 50Hz, 3-phase<br>Free ball passage for solids-handling min. 50mm                                                                                                                                                                                                                                                                                        | No.  | 1        |  |  |
| 2.1.4.2                                                |  | 50 mm HDPE piping within sump, necessary supports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | m    | 8        |  |  |
| 2.1.4.3                                                |  | 50mm gate valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | No.  | 1        |  |  |
| <b>2.1.5</b>                                           |  | <b>Pump Protection and Instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |          |  |  |
| 2.1.5.1.                                               |  | Supply and install an electronic pressure gauge (positioned after pump control or throttling valve), and conduct pipe system curve verification tests to determine actual system curve when pumping into the system. Sump Float valve. The successful bidder shall use a portable ultrasonic flowmeter to do this test. The pressure gauge shall be mounted in the valve chamber, downstream of all valves which may restrict flow, but upstream of the final pipeline isolating valve. Note: Pump duty ( for new pumps) may require adjustment on completion of this system curve verification exercise. | No.  | 2        |  |  |
| 2.1.5.2.                                               |  | Pressure transmitter, 0 to 1500kPa, non-intrusive type, with an integrated local LCD display, and shall be mounted downstream of each pump. The signal shall also be routed to the MCC panel.                                                                                                                                                                                                                                                                                                                                                                                                             | No.  | 2        |  |  |
| 2.1.5.3.                                               |  | No flow switch (non-intrusive to flow, e.g Doppler Effect type), which shall be used for pump protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | No.  | 2        |  |  |
| 2.1.5.4.                                               |  | Temperature probe, PT100 for the DE and NDE bearings, which shall be used for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Pair | 2        |  |  |

RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA

|                       |  |                                    |  |  |  |  |
|-----------------------|--|------------------------------------|--|--|--|--|
|                       |  | pump protection on electric motors |  |  |  |  |
| TOTAL CARRIED FORWARD |  |                                    |  |  |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                        | UNIT | QUANTITY |  |  |
|------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |          |  |  |
| 2.1.5.5.                     |  | Vibration probe for the DE and NDE bearings, which shall be used for pump protection                                                                                                                                                                                                                                                                                                                                                               | Pair | 2        |  |  |
| 2.1.5.6.                     |  | Pressure Switch with alarm contacts, with minimum and maximum pressure limits as per the pump head complete with wiring to the MCC.                                                                                                                                                                                                                                                                                                                | No.  | 2        |  |  |
| <b>2.1.6.</b>                |  | <b>CATHODIC ISOLATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |      |          |  |  |
| 2.1.6.1                      |  | Cathodic isolation for each pump                                                                                                                                                                                                                                                                                                                                                                                                                   | No.  | 2        |  |  |
| <b>2.1.7</b>                 |  | <b>CORROSION PROTECTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |      |          |  |  |
| 2.1.7.1                      |  | Preparation of surfaces, fusion-bonded epoxy, 150µm dry film thickness, internal and externally on pipework, pumps and fittings, for existing installations being refurbished.                                                                                                                                                                                                                                                                     | No.  | 1        |  |  |
| 2.1.7.2                      |  | Painting of pipework, pumps and fittings in line with the set colour-coding convention                                                                                                                                                                                                                                                                                                                                                             | Sum  | 1        |  |  |
| <b>2.1.8</b>                 |  | <b>GRINDERS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |          |  |  |
| 2.1.8.1                      |  | Supply and install an in-channel grinder (counter-rotating)individually stacked with 17 & 17 tooth serrated wipe ready cutters double edge 4130 alloy steel fitted with knurled spacers. Both cutter and spacers are through hardened, and heat treated to 52-55 Rockwell C. Grinders are supplied with integrated Delta P® high flow side rails and Optimum Cut Control. Unit will be supplied with a 3kW/4P/380V/IP55 motor and PLC control unit | No.  | 1        |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |                                                                                                                                                                                                                     |             |                 |  |  |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|--|--|
| <b>2.1.9</b>                 | <b>QUALITY ASSURANCE</b>                                                                                                                                                                                            |             |                 |  |  |
| 2.1.9.1                      | Preparation of a Quality Management Plan and implementation thereof, as aligned with DWS and SANS.                                                                                                                  | No.         | 1               |  |  |
| 2.1.9.2                      | Compliance with the Quality Management Plan by an independent accredited specialist consultant                                                                                                                      | No.         | 1               |  |  |
| 2.1.9.3                      | Manufacturer's works or factory acceptance testing                                                                                                                                                                  | No.         | 1               |  |  |
| 2.1.9.4                      | Pressure testing of all pipework                                                                                                                                                                                    | No.         | 1               |  |  |
| 2.1.9.5                      | Site acceptance testing on two new pumps (contractor to supply all necessary equipment for testing) and the installation, including issuing of certificates of compliance, test & commissioning sheets and reports. | No.         | 1               |  |  |
| 2.1.9.6                      | Training of the staff and issuing of manuals and soft copies of the data packs                                                                                                                                      | No.         | 1               |  |  |
| <b>TOTAL CARRIED FORWARD</b> |                                                                                                                                                                                                                     |             |                 |  |  |
| <b>ITEM</b>                  | <b>DESCRIPTION</b>                                                                                                                                                                                                  | <b>UNIT</b> | <b>QUANTITY</b> |  |  |



**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |      |  |  |
|------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|--|--|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |      |  |  |
| 2.2                          |  | <b>TIKWANA PUMP STATION 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |      |  |  |
|                              |  | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |      |  |  |
| 2.2.1                        |  | <b>PUMPS SETS, GUAGES &amp; FITTINGS</b><br><i>Supply, delivery, installation, testing and commissioning of pumps, pipework, fittings, bends, elbows, reducers and other listed installations, complete with flanges, gaskets, bolts, nuts and washers, All Flanges to be SANS 1123.Refer to Pipe schedule in the drawings book.</i><br><br><i>Hidrostal screw-centrifugal or similar approved</i><br>New submersible raw-sewage pump sets with (one duty and the other standby), Duckfoot type with guide rail.<br>Suitable for pumping of wastewater and sewage.<br>Water-pressure tight, encapsulated, IP68 flood-proof motor and X20Cr13 stainless steel shaft.<br>Bimetal switch for thermal protection and conductivity probe for early detection of moisture ingress in seal chamber.<br>duties: 34 l/s (122.4 m3/h) at a head of 21.37 metres<br>It is essential to read through the specifications, and to understand the system curves, when pricing.<br>and Hydraulic efficiency shall be at least 59%. <i>The engineer shall give prior approval before a purchase order is placed.</i> | No. | 2    |  |  |
|                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     | INCL |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |      |  |  |

# RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS

| TO WASTE WATER TREATMENT PLANT IN HOORSTAD AND TIKWANA |  |                                                                                                                                                                                                                                                                           |      |          |  |  |
|--------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| ITEM                                                   |  | DESCRIPTION                                                                                                                                                                                                                                                               | UNIT | QUANTITY |  |  |
| TOTAL BROUGHT FORWARD                                  |  |                                                                                                                                                                                                                                                                           |      |          |  |  |
| 2.2.2                                                  |  | Motor 400V, 50Hz, 4-pole, IE3, efficiency IP68, 11 kW at 2925 rpm; Continuous running duty; Class H insulation; PT100 probes for windings temperature.                                                                                                                    |      | INCL     |  |  |
| <b>2.2.3</b>                                           |  | <b>PIPING &amp; VALVES</b>                                                                                                                                                                                                                                                |      |          |  |  |
| 2.2.3.1                                                |  | Suction pipe, HDPE, 160 NB, complete with specials, flanges, puddle flanges, fittings and VJ coupling, crotch plate, FBE to 150 microns, and painting, complete with fittings (Pipe Reducers and bends) and suction bellmouth (with baffles), and installed into forebay. | m    | 15       |  |  |
| 2.2.3.2                                                |  | Delivery pipe, HDPE 160 NB, complete with specials, flanges, fittings and VJ coupling, crotch plate, FBE to 150 microns, and painting, complete with fittings (pipe reducers and bends) connecting into main delivery manifold.                                           | m    | 20       |  |  |
| 2.2.3.3                                                |  | Resilient gate valve, rising stem, <b>Suction</b> side : <b>160 NB, PN10</b> , flanged to SABS 1123                                                                                                                                                                       | No.  | 2        |  |  |
| 2.2.3.4                                                |  | Resilient gate valve metal, rising stem, <b>Delivery</b> side : <b>160 NB, PN16</b> , flanged to SABS 1123                                                                                                                                                                | No.  | 3        |  |  |
| 2.2.3.5                                                |  | Non-return valve, <b>160 NB, PN25</b> , tilted disc type with an operating stroke of not more than 40°, flanged to SABS 1123                                                                                                                                              | No.  | 2        |  |  |
| <b>2.2.4</b>                                           |  | <b>DEWATERING PUMP</b>                                                                                                                                                                                                                                                    |      |          |  |  |
| 2.2.4.1                                                |  | Hidrostal compact submersible pump set or similar approved (pump and motor systems) for the de-watering of the pump chamber each with a capacity of 10.1 l/s at a head of 10.28 metres at                                                                                 | No.  | 1        |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|  |  |                                                                                                                          |  |  |  |  |  |  |
|--|--|--------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|
|  |  | a hydraulic efficiency of at least 60%.<br>1.8kW, 400V, 50Hz, 3-phase<br>Free ball passage for solids-handling min. 50mm |  |  |  |  |  |  |
|--|--|--------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |   |  |  |
|------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|--|--|
| 2.2.4.2                      |  | 50 mm HDPE piping within sump, necessary supports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | m    | 8 |  |  |
| 2.2.4.3                      |  | 50mm gate valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No.  | 1 |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |   |  |  |
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |   |  |  |
| <b>2.2.5</b>                 |  | <b>Pump Protection and Instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |   |  |  |
| 2.2.5.1.                     |  | Supply and install an electronic pressure gauge (positioned after pump control or throttling valve), and conduct pipe system curve verification tests to determine actual system curve when pumping into the system. Sump float valve The successful bidder shall use a portable ultrasonic flowmeter to do this test. The pressure gauge shall be mounted in the valve chamber, downstream of all valves which may restrict flow, but upstream of the final pipeline isolating valve. Note: Pump duty ( for new pumps) may require adjustment on completion of this system curve verification exercise. | No.  | 2 |  |  |
| 2.2.5.2.                     |  | Pressure transmitter, 0 to 1500kPa, non-intrusive type, with an integrated local LCD display, and shall be mounted downstream of each pump. The signal shall also be routed to the MCC panel.                                                                                                                                                                                                                                                                                                                                                                                                            | No.  | 2 |  |  |
| 2.2.5.3.                     |  | No flow switch (non-intrusive to flow, e.g Doppler Effect type), which shall be used for pump protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | No.  | 2 |  |  |
| 2.2.5.4.                     |  | Temperature probe, PT100 for the DE and NDE bearings, which shall be used for pump protection <b>on electric motors</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Pair | 2 |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |   |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         |  | DESCRIPTION                                                                                                                                                                    | UNIT | QUANTITY |  |  |
|------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                |      |          |  |  |
| 2.2.5.5.                     |  | Vibration probe for the DE and NDE bearings, which shall be used for pump protection                                                                                           | Pair | 2        |  |  |
| 2.2.5.6.                     |  | Pressure Switch with alarm contacts, with minimum and maximum pressure limits as per the pump head complete with wiring to the MCC.                                            | No.  | 2        |  |  |
| <b>2.2.6.</b>                |  | <b>CATHODIC ISOLATION</b>                                                                                                                                                      |      |          |  |  |
| 2.2.6.1                      |  | Cathodic isolation for each pump                                                                                                                                               | No.  | 2        |  |  |
| <b>2.2.7.</b>                |  | <b>CORROSION PROTECTION</b>                                                                                                                                                    |      |          |  |  |
| 2.2.7.1                      |  | Preparation of surfaces, fusion-bonded epoxy, 150µm dry film thickness, internal and externally on pipework, pumps and fittings, for existing installations being refurbished. | No.  | 1        |  |  |
| 2.2.7.2                      |  | Painting of pipework, pumps and fittings in line with the set colour-coding convention                                                                                         | No.  | 1        |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                |      |          |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                | UNIT | QUANTITY |  |  |
|------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |          |  |  |
| <b>2.2.8</b><br>2.1.8.1      |  | <b>GRINDERS</b><br><br>Supply and install an in-channel grinder (counter-rotating) individually stacked with 17 & 17 tooth serrated wipe ready cutters double edge 4130 alloy steel fitted with knurled spacers. Both cutter and spacers are through hardened, and heat treated to 52-55 Rockwell C. Grinders are supplied with integrated Delta P® high flow side rails and Optimum Cut Control. Unit will be supplied with a 3kW/4P/380V/IP55 motor and PLC control unit | No.  | 1        |  |  |
| <b>2.2.9</b><br>2.2.9.1      |  | <b>QUALITY ASSURANCE</b><br>Preparation of a Quality Management Plan and implementation thereof, as aligned with DWS and SANS.                                                                                                                                                                                                                                                                                                                                             | No.  | 1        |  |  |
| 2.2.9.2                      |  | Compliance with the Quality Management Plan by an independent accredited specialist consultant                                                                                                                                                                                                                                                                                                                                                                             | No.  | 1        |  |  |
| 2.2.9.3                      |  | Manufacturer's works or factory acceptance testing                                                                                                                                                                                                                                                                                                                                                                                                                         | No.  | 1        |  |  |
| 2.2.9.4                      |  | Pressure testing of all pipework                                                                                                                                                                                                                                                                                                                                                                                                                                           | No.  | 1        |  |  |
| 2.2.9.5                      |  | Site acceptance testing on two new pumps (contractor to supply all necessary equipment for testing) and the installation, including issuing of certificates of compliance, test & commissioning sheets and reports.                                                                                                                                                                                                                                                        | No.  | 1        |  |  |
| 2.2.9.6                      |  | Training of the staff and issuing of manuals and soft copies of the data packs                                                                                                                                                                                                                                                                                                                                                                                             | No.  | 1        |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |          |  |  |
| ITEM                         |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                | UNIT | QUANTITY |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| TOTAL BROUGHT FORWARD |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |      |  |  |
|-----------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|--|--|
| 2.3                   |  | <b>TIKWANA PUMP STATION 2</b><br><i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |      |  |  |
| 2.3.1                 |  | <b>PUMPS SETS, GUAGES &amp; FITTINGS</b><br><i>Supply, delivery, installation, testing and commissioning of pumps, pipework, fittings, bends, elbows, reducers and other listed installations, complete with flanges, gaskets, bolts, nuts and washers, All Flanges to be SANS 1123. Refer to Pipe schedule in the drawings book.</i><br><br><i>Hidrostal screw-centrifugal or similar approved</i><br>New submersible raw-sewage pump sets with (one duty and the other standby),<br>Duckfoot type with guide rail.<br>Suitable for pumping of wastewater and sewage.<br>Water-pressure tight, encapsulated, IP68<br>flood-proof motor and X20Cr13 stainless steel shaft.<br><br>Bimetal switch for thermal protection and conductivity probe for early detection of moisture ingress in seal chamber.<br>duties: 16.5 l/s (59.4 m3/h) at a head of 8.54 metres<br>It is essential to read through the specifications, and to understand the system curves, when pricing.<br>and Hydraulic efficiency shall be at least 59%. <i>The engineer shall give prior approval before a purchase order is placed.</i> | No. | 2    |  |  |
|                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     | INCL |  |  |
| TOTAL CARRIED FORWARD |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |      |  |  |

# RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS

## TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA

| ITEM                  | DESCRIPTION                                                                                                                                                                                                                                                                                                  | UNIT | QUANTITY |  |  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| TOTAL BROUGHT FORWARD |                                                                                                                                                                                                                                                                                                              |      |          |  |  |
| 2.3.2                 | Motor 380V -420V, 50Hz, 4-pole, IE3, efficiency IP68, 2.6 kW at 2760 rpm; Continuous running duty; Class H insulation; PT100 probes for windings temperature.                                                                                                                                                |      | INCL     |  |  |
| <b>2.3.3</b>          | <b>PIPING &amp; VALVES</b>                                                                                                                                                                                                                                                                                   |      |          |  |  |
| 2.3.3.1               | Suction pipe, HDPE, 160 NB, 6mm, complete with specials, flanges, puddle flanges, fittings and VJ coupling, crotch plate, FBE to 150 microns, and painting, complete with fittings (Pipe Reducers and bends) and suction bellmouth (with baffles), and installed into forebay.                               | m    | 15       |  |  |
| 2.3.3.2               | Delivery pipe, HDPE 160 NB, complete with specials, flanges, fittings and VJ coupling, crotch plate, FBE to 150 microns, and painting, complete with fittings (pipe reducers and bends) connecting into main delivery manifold.                                                                              | m    | 20       |  |  |
| 2.3.3.3               | Resilient gate valve, rising stem, <b>Suction</b> side : <b>160 NB, PN10</b> , flanged to SABS 1123                                                                                                                                                                                                          | No.  | 2        |  |  |
| 2.3.3.4               | Resilient gate valve metal, rising stem, <b>Delivery</b> side : <b>160 NB, PN16</b> , flanged to SABS 1123                                                                                                                                                                                                   | No.  | 3        |  |  |
| 2.3.3.5               | Non-return valve, <b>160 NB, PN25</b> , tilted disc type with an operating stroke of not more than 40°, flanged to SABS 1123                                                                                                                                                                                 | No.  | 2        |  |  |
| <b>2.3.4</b>          | <b>DEWATERING PUMP</b>                                                                                                                                                                                                                                                                                       |      |          |  |  |
| 2.3.4.1               | Hidrostal compact submersible pump set or similar approved (pump and motor systems) for the de-watering of the pump chamber each with a capacity of 10.1 l/s at a head of 10.28 metres at a hydraulic efficiency of at least 60%. 1.8kW, 400V, 50Hz, 3-phase Free ball passage for solids-handling min. 50mm | No.  | 1        |  |  |
| 2.3.4.2               | 50 mm HDPE piping within sump, necessary supports                                                                                                                                                                                                                                                            | m    | 8        |  |  |
| 2.3.4.3               | 50mm gate valve                                                                                                                                                                                                                                                                                              | No.  | 1        |  |  |



**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                       |  |  |  |  |
|-----------------------|--|--|--|--|
| TOTAL CARRIED FORWARD |  |  |  |  |
|-----------------------|--|--|--|--|

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | UNIT | QUANTITY |  |  |
|------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |          |  |  |
| <b>2.3.5</b>                 |  | <b>Pump Protection and Instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |          |  |  |
| 2.3.5.1                      |  | Supply and install an electronic pressure gauge (positioned after pump control or throttling valve), and conduct pipe system curve verification tests to determine actual system curve when pumping into the system. The successful bidder shall use a portable ultrasonic flowmeter to do this test. The pressure gauge shall be mounted in the valve chamber, downstream of all valves which may restrict flow, but upstream of the final pipeline isolating valve. Note: Pump duty ( for new pumps) may require adjustment on completion of this system curve verification exercise. | No.  | 2        |  |  |
| 2.3.5.2                      |  | Pressure transmitter, 0 to 1500kPa, non-intrusive type, with an integrated local LCD display, and shall be mounted downstream of each pump. The signal shall also be routed to the MCC panel.                                                                                                                                                                                                                                                                                                                                                                                           | No.  | 2        |  |  |
| 2.3.5.3                      |  | No flow switch (non-intrusive to flow, e.g Doppler Effect type), which shall be used for pump protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No.  | 2        |  |  |
| 2.3.5.4                      |  | Temperature probe, PT100 for the DE and NDE bearings, which shall be used for pump protection <b>on electric motors</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Pair | 2        |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |          |  |  |

# RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS

| TO WASTE WATER TREATMENT PLANT IN HOORSTAD AND TIKWANA |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |          |  |
|--------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|
| ITEM                                                   |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                         | UNIT | QUANTITY |  |
| <b>TOTAL BROUGHT FORWARD</b>                           |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |          |  |
| 2.3.5.5                                                |  | Vibration probe for the DE and NDE bearings, which shall be used for pump protection                                                                                                                                                                                                                                                                                                                                                                | Pair | 2        |  |
| 2.3.5.6                                                |  | Pressure Switch with alarm contacts, with minimum and maximum pressure limits as per the pump head complete with wiring to the MCC.                                                                                                                                                                                                                                                                                                                 | No.  | 2        |  |
| <b>2.3.7</b>                                           |  | <b>CATHODIC ISOLATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |  |
| 2.3.7.1                                                |  | Cathodic isolation for each pump                                                                                                                                                                                                                                                                                                                                                                                                                    | No.  | 2        |  |
| <b>2.3.8.</b>                                          |  | <b>CORROSION PROTECTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |      |          |  |
| 2.3.8.1.                                               |  | Preparation of surfaces, fusion-bonded epoxy, 150µm dry film thickness, internal and externally on pipework, pumps and fittings, for existing installations being refurbished.                                                                                                                                                                                                                                                                      | No.  | 1        |  |
| 2.3.8.2                                                |  | Painting of pipework, pumps and fittings in line with the set colour-coding convention                                                                                                                                                                                                                                                                                                                                                              | No.  | 1        |  |
| <b>2.3.9</b>                                           |  | <b>GRINDERS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |          |  |
| 2.3.9.1                                                |  | Supply and install an in-channel grinder (counter-rotating) individually stacked with 17 & 17 tooth serrated wipe ready cutters double edge 4130 alloy steel fitted with knurled spacers. Both cutter and spacers are through hardened, and heat treated to 52-55 Rockwell C. Grinders are supplied with integrated Delta P® high flow side rails and Optimum Cut Control. Unit will be supplied with a 3kW/4P/380V/IP55 motor and PLC control unit | No.  | 1        |  |
| <b>2.3.10</b>                                          |  | <b>QUALITY ASSURANCE</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |      |          |  |
| 2.2.10.1                                               |  | Preparation of a Quality Management Plan and implementation thereof, as aligned with DWS and SANS.                                                                                                                                                                                                                                                                                                                                                  | No.  | 1        |  |
| 2.3.10.2                                               |  | Compliance with the Quality Management Plan by an independent accredited specialist consultant                                                                                                                                                                                                                                                                                                                                                      | No.  | 1        |  |
| 2.3.10.3                                               |  | Manufacturer's works or factory acceptance testing                                                                                                                                                                                                                                                                                                                                                                                                  | No.  | 1        |  |
| 2.3.10.4                                               |  | Pressure testing of all pipework                                                                                                                                                                                                                                                                                                                                                                                                                    | No.  | 1        |  |
| 2.3.10.5                                               |  | Site acceptance testing on two new pumps (contractor to supply all necessary equipment for testing) and the installation, including issuing of certificates of                                                                                                                                                                                                                                                                                      | No.  | 1        |  |

# RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS

## TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA

|                              |  | compliance, test & commissioning sheets and reports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |          |  |  |
|------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| 2.3.10.6                     |  | Training of the staff and issuing of manuals and soft copies of the data packs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No.  | 1        |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |          |  |  |
| ITEM                         |  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | UNIT | QUANTITY |  |  |
| 2.4                          |  | <b>TIKWANA PUMP STATION 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |          |  |  |
|                              |  | <i><b>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</b></i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |          |  |  |
| 2.4.1                        |  | <b>PUMPS SETS, GUAGES &amp; FITTINGS</b><br><i>Supply, delivery, installation, testing and commissioning of pumps, pipework, fittings, bends, elbows, reducers and other listed installations, complete with flanges, gaskets, bolts, nuts and washers, All Flanges to be SANS 1123.Refer to Pipe schedule in the drawings book.</i><br><br><i>Hidrostal screw-centrifugal or similar approved</i><br>New submersible raw-sewage pump sets with (one duty and the other standby), Duckfoot type with guide rail. Suitable for pumping of wastewater and sewage. Water-pressure tight, encapsulated, IP68 flood-proof motor and X20Cr13 stainless steel shaft. Bimetal switch for thermal protection and conductivity probe for early detection of moisture ingress in seal chamber.<br>duties: 8.59 l/s (30.924 m3/h) at a head of 7.55 metres<br>It is essential to read through the specifications, and to understand the system curves, when pricing.<br>and Hydraulic efficiency shall be at least 59%. <b>The engineer shall give prior approval before a purchase order is placed.</b> | No.  | 2        |  |  |
|                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      | INCL     |  |  |
| 2.4.2                        |  | Motor 400V, 50Hz, 4-pole, IE3, efficiency IP68, 1.2 kW at 2905 rpm; Continuous running duty; Class H insulation; PT100 probes for windings temperature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      | INCL     |  |  |
| 2.4.3                        |  | <b>PIPING &amp; VALVES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |          |  |  |
| 2.4.3.1.                     |  | Suction pipe, HDPE, 160 NB,<br>complete with specials, flanges, puddle flanges, fittings and VJ coupling, crotch plate, FBE to 150 microns, and painting, complete with fittings (Pipe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | m    | 15       |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |  |                                                                                             |  |  |  |  |
|------------------------------|--|---------------------------------------------------------------------------------------------|--|--|--|--|
|                              |  | Reducers and bends) and suction<br>bellmouth (with baffles), and installed into<br>forebay. |  |  |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                             |  |  |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |    |  |  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|--|--|
| 2.4.3.2      | Delivery pipe, HDPE<br>160 NB, complete with specials,<br>flanges, fittings and VJ coupling, crotch<br>plate, FBE to 150 microns, and painting,<br>complete with fittings (pipe reducers and<br>bends) connecting into main delivery<br>manifold.                                                                                                                                                                                                                                                                                                                                                                                                | m   | 20 |  |  |
| 2.4.3.3      | Resilient gate valve, rising stem, <b>Suction</b><br>side : <b>160 NB, PN10</b> , flanged to SABS 1123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | No. | 2  |  |  |
| 2.4.3.4      | Resilient gate valve metal, rising stem,<br><b>Delivery</b> side : <b>160 NB, PN16</b> , flanged to<br>SABS 1123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | No. | 3  |  |  |
| 2.4.3.5      | Non-return valve, <b>160 NB, PN25</b> , tilted disc<br>type with an operating stroke of not more<br>than 40°, flanged to SABS 1123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No. | 2  |  |  |
| <b>2.4.4</b> | <b>DEWATERING PUMP</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |    |  |  |
| 2.4.4.1      | Hidrostal compact submersible pump set or similar<br>approved (pump and motor systems) for the<br>de-watering of the pump chamber each with a<br>capacity of 10.1 l/s at a head of 10.28 metres at<br>a hydraulic efficiency of at least 60%.<br>1.8kW, 400V, 50Hz, 3-phase<br>Free ball passage for solids-handling min. 50mm                                                                                                                                                                                                                                                                                                                   | No. | 1  |  |  |
| 2.4.4.2      | 50 mm HDPE piping within sump, necessary supports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | m   | 8  |  |  |
| 2.4.4.3      | 50mm gate valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | No. | 1  |  |  |
| <b>2.4.5</b> | <b>Pump Protection and Instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |    |  |  |
| 2.4.5.1      | Supply and install an electronic pressure<br>gauge (positioned after pump control or<br>throttling valve), and conduct pipe system<br>curve verification tests to determine actual<br>system curve when pumping into the<br>system. Sump float valve. The successful bidder shall use a<br>portable ultrasonic flowmeter to do this test.<br>The pressure gauge shall be mounted in<br>the valve chamber, downstream of all valves<br>which may restrict flow, but upstream of the<br>final pipeline isolating valve. Note: Pump<br>duty ( for new pumps) may require<br>adjustment on completion of this system<br>curve verification exercise. | No. | 2  |  |  |
| 2.4.5.2      | Pressure transmitter, 0 to 1500kPa, non-intrusive type<br>with an integrated local LCD display, and shall be<br>mounted downstream of each pump. The signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | No. | 2  |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|         |                                                                                                           |     |   |  |  |
|---------|-----------------------------------------------------------------------------------------------------------|-----|---|--|--|
|         | shall also be routed to the MCC panel.                                                                    |     |   |  |  |
| 2.4.5.3 | No flow switch (non-intrusive to flow, e.g Doppler Effect type), which shall be used for pump protection. | No. | 2 |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |  |
|------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|--|--|
| 2.4.5.4                      |  | Temperature probe, PT100 for the DE and NDE bearings, which shall be used for pump protection <b>on electric motors</b>                                                                                                                                                                                                                                                                                                                             | Pair        | 2               |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |  |
| <b>ITEM</b>                  |  | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>UNIT</b> | <b>QUANTITY</b> |  |  |
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |  |
| 2.4.5.5                      |  | Vibration probe for the DE and NDE bearings, which shall be used for pump protection                                                                                                                                                                                                                                                                                                                                                                | Pair        | 2               |  |  |
| 2.4.5.6                      |  | Pressure Switch with alarm contacts, with minimum and maximum pressure limits as per the pump head complete with wiring to the MCC.                                                                                                                                                                                                                                                                                                                 | No.         | 2               |  |  |
| <b>2.4.6</b>                 |  | <b>CATHODIC ISOLATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                           |             |                 |  |  |
| 2.4.6.1                      |  | Cathodic isolation for each pump                                                                                                                                                                                                                                                                                                                                                                                                                    | No.         | 2               |  |  |
| <b>2.4.7</b>                 |  | <b>CORROSION PROTECTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                 |  |  |
| 2.4.7.1                      |  | Preparation of surfaces, fusion-bonded epoxy, 150µm dry film thickness, internal and externally on pipework, pumps and fittings, for existing installations being refurbished.                                                                                                                                                                                                                                                                      | No.         | 1               |  |  |
| 2.4.7.2                      |  | Painting of pipework, pumps and fittings in line with the set colour-coding convention                                                                                                                                                                                                                                                                                                                                                              | No.         | 1               |  |  |
| <b>2.4.8</b>                 |  | <b>GRINDERS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |  |
| 2.4.8.1                      |  | Supply and install an in-channel grinder (counter-rotating) individually stacked with 17 & 17 tooth serrated wipe ready cutters double edge 4130 alloy steel fitted with knurled spacers. Both cutter and spacers are through hardened, and heat treated to 52-55 Rockwell C. Grinders are supplied with integrated Delta P® high flow side rails and Optimum Cut Control. Unit will be supplied with a 3kW/4P/380V/IP55 motor and PLC control unit | No.         | 1               |  |  |



**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |                                                                                                                                                                                                                     |     |   |  |  |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|--|
| <b>2.4.9</b>                 | <b>QUALITY ASSURANCE</b>                                                                                                                                                                                            |     |   |  |  |
| 2.2.9.1                      | Preparation of a Quality Management Plan and implementation thereof, as aligned with DWS and SANS.                                                                                                                  | No. | 1 |  |  |
| 2.4.9.2                      | Compliance with the Quality Management Plan by an independent accredited specialist consultant                                                                                                                      | No. | 1 |  |  |
| 2.4.9.3                      | Manufacturer's works or factory acceptance testing                                                                                                                                                                  | No. | 1 |  |  |
| 2.4.9.4                      | Pressure testing of all pipework                                                                                                                                                                                    | No. | 1 |  |  |
| 2.4.9.5                      | Site acceptance testing on two new pumps (contractor to supply all necessary equipment for testing) and the installation, including issuing of certificates of compliance, test & commissioning sheets and reports. | No. | 1 |  |  |
| 2.4.9.6                      | Training of the staff and issuing of manuals and soft copies of the data packs                                                                                                                                      | No. | 1 |  |  |
| <b>TOTAL CARRIED FORWARD</b> |                                                                                                                                                                                                                     |     |   |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | UNIT | QUANTITY | AMOUNT |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--------|
| <b>TOTAL BROUGHT FORWARD</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |          |        |
| <b>2.5</b>                   | <b>TIKWANA PUMP STATION 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |          |        |
|                              | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |          |        |
| 2.5.1                        | <b>PUMPS SETS, GUAGES &amp; FITTINGS</b><br><i>Supply, delivery, installation, testing and commissioning of pumps, pipework, fittings, bends, elbows, reducers and other listed installations, complete with flanges, gaskets, bolts, nuts and washers, All Flanges to be SANS 1123.Refer to Pipe schedule in the drawings book.</i><br><br><i>Hidrostal screw-centrifugal or similar approved</i><br><br>New submersible raw-sewage pump sets with (one duty and the other standby), Duckfoot type with guide rail. Suitable for pumping of wastewater and sewage. Water-pressure tight, encapsulated, IP68 flood-proof motor and X20Cr13 stainless steel shaft. Bimetal switch for thermal protection and conductivity probe for early detection of moisture ingress in seal chamber. duties: 13.4 l/s (48.24 m3/h) at a head of 11.1 metres<br><br>It is essential to read through the specifications, and to understand the system curves, when pricing.<br><br>and Hydraulic efficiency shall be at least 59%. <b>The engineer shall give prior approval before a purchase order is placed.</b> | No.  | 2        |        |
| 2.5.2                        | Motor 400V, 50Hz, 4-pole, IE3, efficiency IP68, 2.4 kW at 1450 rpm; Continuous running duty; Class H insulation; PT100 probes for windings temperature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      | INCL     |        |
| 2.5.3                        | <b>PIPING &amp; VALVES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |        |
| 2.5.3.1                      | Suction pipe, HDPE, 160 NB, complete with specials, flanges, puddle flanges, fittings and VJ coupling, crotch plate, FBE to 150 microns, and painting, complete with fittings (Pipe Reducers and bends) and suction bellmouth (with baffles), and installed into forebay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | m    | 15       |        |
| <b>TOTAL CARRIED FORWARD</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |          |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |    |  |  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|--|--|
| 2.5.3.2      | Delivery pipe, HDPE<br>160 NB, complete with specials,<br>flanges, fittings and VJ coupling, crotch<br>plate, FBE to 150 microns, and painting,<br>complete with fittings (pipe reducers and<br>bends) connecting into main delivery<br>manifold.                                                                                                                                                                                                                                                                                                                                                                                                   | m   | 20 |  |  |
| 2.5.3.3      | Resilient gate valve, rising stem, <b>Suction</b><br>side : <b>160 NB, PN10</b> , flanged to SABS 1123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | No. | 2  |  |  |
| 2.5.3.4      | Resilient gate valve metal, rising stem,<br><b>Delivery</b> side : <b>160 NB, PN16</b> , flanged to<br>SABS 1123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | No. | 3  |  |  |
| 2.5.3.5      | Non-return valve, <b>160 NB, PN25</b> , tilted disc<br>type with an operating stroke of not more<br>than 40°, flanged to SABS 1123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | No. | 2  |  |  |
| <b>2.5.4</b> | <b>DEWATERING PUMP</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |    |  |  |
| 2.5.4.1      | Hidrostal compact submersible pump set or similar<br>approved (pump and motor systems) for the<br>de-watering of the pump chamber each with a<br>capacity of 10.1 l/s at a head of 10.28 metres at<br>a hydraulic efficiency of at least 60%.<br>1.8kW, 400V, 50Hz, 3-phase<br>Free ball passage for solids-handling min. 50mm                                                                                                                                                                                                                                                                                                                      | No. | 1  |  |  |
| 2.5.4.2      | 50 mm HDPE piping within sump, necessary supports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | m   | 8  |  |  |
| 2.5.4.3      | 50mm gate valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | No. | 1  |  |  |
| <b>2.5.5</b> | <b>Pump Protection and Instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |    |  |  |
| 2.5.5.1      | Supply and install an electronic pressure<br>gauge (positioned after pump control or<br>throttling valve), and conduct pipe system<br>curve verification tests to determine actual<br>system curve when pumping into the<br>system. The successful bidder shall use a<br>portable ultrasonic flowmeter to do this test.<br>Sump float valve.<br>The pressure gauge shall be mounted in<br>the valve chamber, downstream of all valves<br>which may restrict flow, but upstream of the<br>final pipeline isolating valve. Note: Pump<br>duty ( for new pumps) may require<br>adjustment on completion of this system<br>curve verification exercise. | No. | 2  |  |  |
| 2.5.5.2      | Pressure transmitter, 0 to 1500kPa,<br>non-intrusive type, with an integrated local<br>LCD display, and shall be mounted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | No. | 2  |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|         |                                                                                                                                                                                             |     |   |  |  |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|--|
| 2.5.5.3 | downstream of each pump. The signal shall also be routed to the MCC panel.<br><br>No flow switch (non-intrusive to flow, e.g Doppler Effect type), which shall be used for pump protection. | No. | 2 |  |  |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|--|

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| TOTAL CARRIED FORWARD |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |   |  |
|-----------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|--|
| 2.5.5.4               |  | Temperature probe, PT100 for the DE and NDE bearings, which shall be used for pump protection <b>on electric motors</b>                                                                                                                                                                                                                                                                                                                            | Pair | 2 |  |
| 2.5.5.5               |  | Vibration probe for the DE and NDE bearings, which shall be used for pump protection                                                                                                                                                                                                                                                                                                                                                               | Pair | 2 |  |
| 2.5.5.6               |  | Pressure Switch with alarm contacts, with minimum and maximum pressure limits as per the pump head complete with wiring to the MCC.                                                                                                                                                                                                                                                                                                                | No.  | 2 |  |
| <b>2.5.7</b>          |  | <b>CATHODIC ISOLATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |      |   |  |
| 2.5.7.1               |  | Cathodic isolation for each pump                                                                                                                                                                                                                                                                                                                                                                                                                   | No.  | 2 |  |
| <b>2.5.8</b>          |  | <b>CORROSION PROTECTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |      |   |  |
| <b>2.5.8.1</b>        |  | Preparation of surfaces, fusion-bonded epoxy 150µm dry film thickness, internal and externally on pipework, pumps and fittings, for existing installations being refurbished                                                                                                                                                                                                                                                                       | No.  | 1 |  |
| 2.5.8.2               |  | Painting of pipework, pumps and fittings in line with the set colour-coding convention                                                                                                                                                                                                                                                                                                                                                             | No.  | 1 |  |
| 2.5.9                 |  | <b>GRINDERS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |   |  |
| 2.5.9.1               |  | Supply and install an in-channel grinder (counter-rotating)individually stacked with 17 & 17 tooth serrated wipe ready cutters double edge 4130 alloy steel fitted with knurled spacers. Both cutter and spacers are through hardened, and heat treated to 52-55 Rockwell C. Grinders are supplied with integrated Delta P® high flow side rails and Optimum Cut Control. Unit will be supplied with a 3kW/4P/380V/IP55 motor and PLC control unit | No.  | 1 |  |
| <b>2.5.10</b>         |  | <b>QUALITY ASSURANCE</b>                                                                                                                                                                                                                                                                                                                                                                                                                           |      |   |  |
| <b>2.5.10.1</b>       |  | Preparation of a Quality Management Plan and implementation thereof, as aligned with DWS and SANS.                                                                                                                                                                                                                                                                                                                                                 | No.  | 1 |  |
| 2.5.10.2              |  | Compliance with the Quality Management Plan by an independent accredited specialist consultant                                                                                                                                                                                                                                                                                                                                                     | No.  | 1 |  |
| <b>2.5.10.3</b>       |  | Manufacturer's works or factory acceptance testing                                                                                                                                                                                                                                                                                                                                                                                                 | No.  | 1 |  |
| 2.5.10.4              |  | Pressure testing of all pipework                                                                                                                                                                                                                                                                                                                                                                                                                   | No.  | 1 |  |

# **RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|          |                                                                                                                                                                                                                     |     |   |  |  |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|--|
| 2.5.10.5 | Site acceptance testing on two new pumps (contractor to supply all necessary equipment for testing) and the installation, including issuing of certificates of compliance, test & commissioning sheets and reports. | No. | 1 |  |  |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|--|

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |               |
|------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|--|---------------|
| 2.5.10.6                     |  | Training of the staff and issuing of manuals and soft copies of the data packs                                                                                                                                                                                                                                                                                                                                                                      | No.         | 1               |  |               |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |               |
| <b>ITEM</b>                  |  | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>UNIT</b> | <b>QUANTITY</b> |  | <b>AMOUNT</b> |
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |               |
| <b>2.6</b>                   |  | <b>TIKWANA PUMP STATION 6</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |             |                 |  |               |
|                              |  | <b>GRINDERS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                 |  |               |
| 2.6.1                        |  | Supply and install an in-channel grinder (counter-rotating) individually stacked with 17 & 17 tooth serrated wipe ready cutters double edge 4130 alloy steel fitted with knurled spacers. Both cutter and spacers are through hardened, and heat treated to 52-55 Rockwell C. Grinders are supplied with integrated Delta P® high flow side rails and Optimum Cut Control. Unit will be supplied with a 3kW/4P/380V/IP55 motor and PLC control unit | No.         | 1               |  |               |
| <b>2.7</b>                   |  | <b>WASTE WATER TREATMENT PLANT EQUIPMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                        |             |                 |  |               |
|                              |  | <i>Replacement of the following items Supply and install including testing and commissioning of the following items</i>                                                                                                                                                                                                                                                                                                                             |             |                 |  |               |
| 2.7.1                        |  | FRS 800 x 700 Mechanical Front Rake Screen , 304 Stainless steel (see drawing)                                                                                                                                                                                                                                                                                                                                                                      | No.         | 1               |  |               |
| 2.7.2                        |  | Bio-Reactors vertical shaft mounted mixers 5.5kW (see drawing)                                                                                                                                                                                                                                                                                                                                                                                      | No          | 2               |  |               |
| <b>2.7.3</b>                 |  | Vertical Shaft Aerators at the Bio-Reactor 45kW (see drawing)                                                                                                                                                                                                                                                                                                                                                                                       | <b>No</b>   | <b>2</b>        |  |               |
| <b>2.7.4</b>                 |  | Pump at the Gold-club pump station, 22kW at 83m capacity                                                                                                                                                                                                                                                                                                                                                                                            | <b>No</b>   | <b>1</b>        |  |               |
| 2.7.5                        |  | Berson Ultraviolet unit in the treated effluent pump station, 2 x Inline 400+ Summit, 240/400V 3L+N 50Hz 600W.                                                                                                                                                                                                                                                                                                                                      | <b>No</b>   | <b>1</b>        |  |               |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS  
TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |                                                                                                                                                                                                                                                                                                              |     |   |  |  |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|--|--|
| 2.7.6                        | (See drawing)<br>Re-alignment of the scum skimmer or slut scrappers with scum box (clarifiers), replace centre bearings (clarifiers) and installation of a new complete Drive Cage Assembly for the Clarifiers -new gearbox drive with electrical motor, new end carriage<br>New wheels, shafts and bearings | No  | 1 |  |  |
| 2.7.7                        | Clarifier Centre Bearing (750mm), 0.25kW x 4P, 400V x 3pH motor                                                                                                                                                                                                                                              | No  | 1 |  |  |
| 2.8                          | Allowance of R25 000 for the decommissioning of Hoopestad, Tikwana 1, 2, 3 and 5                                                                                                                                                                                                                             | Sum | 1 |  |  |
| 2.9                          | Temporary hire of pumping system to use during construction for all pump stations                                                                                                                                                                                                                            | No. | 5 |  |  |
| 2.10.                        | Replacement of the 950m diameter metal basket/ mechanical screen (shown on the pump station layout drawing)                                                                                                                                                                                                  | No  | 5 |  |  |
| 2.11                         | Shop/ workshop drawings for all stations                                                                                                                                                                                                                                                                     | No  | 5 |  |  |
| 2.12                         | Pressure testing of all pipework                                                                                                                                                                                                                                                                             | No. | 1 |  |  |
| <b>TOTAL BROUGHT FORWARD</b> |                                                                                                                                                                                                                                                                                                              |     |   |  |  |



**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| SECTION 3: ELECTRICAL - PUMP STATIONS No.1 to 6 AND WASTE WATER TREATMENT PLANT |         |                                                                                                                                                                                                                                |      |          |      |        |
|---------------------------------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|------|--------|
| ITEM                                                                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                    | UNIT | QUANTITY | RATE | AMOUNT |
| 3                                                                               |         | Electrical Works (Supply and Installation of the following items)                                                                                                                                                              |      |          |      |        |
| 3,1                                                                             |         | <b>HOOPSTAD COMMANDO PUMP STATION</b>                                                                                                                                                                                          |      |          |      |        |
|                                                                                 |         | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                        |      |          |      |        |
|                                                                                 |         | <b>Excavation and Trenching</b>                                                                                                                                                                                                |      |          |      |        |
|                                                                                 |         | Allowance must be made for the sifting of soil when required, removal and carting away of all stones and rocks including dumping off site. Backfilling and compaction shall be carried out as specified for overall siteworks. |      |          |      |        |
| 3.1.1                                                                           |         | Excavation and backfilling in soft soil                                                                                                                                                                                        | m³   | 15       |      |        |
| 3.1.2                                                                           |         | Excavation and backfilling in hard rock                                                                                                                                                                                        | m³   | 15       |      |        |
| 3,2                                                                             |         | <b>Power Supply</b>                                                                                                                                                                                                            |      |          |      |        |
| 3.2.1                                                                           |         | Supply and install a power external main distribution board 500x850mm wall-mounted, with a 150kVA 3ph incomer CB weather-proof IP65, complete with LV surge arrestors                                                          | No.  | 1        |      |        |
| 3,3                                                                             |         | <b>Low Voltage PVC Cables, Earth Wire and Terminations</b>                                                                                                                                                                     |      |          |      |        |
|                                                                                 |         | Supply and installation of PVC SWA PVC cable and Earth Wire in trenches or racking complete with terminations.                                                                                                                 |      |          |      |        |
| 3.3.1                                                                           |         | 35mm² 4-core Cu PVC SWA Cable (From Main DB to new distribution board)                                                                                                                                                         | m    | 50       |      |        |
| 3.3.2                                                                           |         | 10mm² 4-core Cu PVC SWA Cable (From Main DB to 2.2kW inline grinder, 2.4kW dewatering pump and new 3.5kW submersible raw sewage pump sets, duty and standby                                                                    | m    | 200      |      |        |
| 3.3.3                                                                           |         | 10mm² 3 core Cu (LN&E) PVC SWA Cable (Main DB to Sub-DBs for buildings & Outside lighting)                                                                                                                                     | m    | 100      |      |        |
| 3.3.4                                                                           |         | 16mm² Cu Insulated Earth Wire                                                                                                                                                                                                  | m    | 50       |      |        |
| 3.3.5                                                                           |         | 10mm² Cu Insulated Earth Wire                                                                                                                                                                                                  | m    | 300      |      |        |
| <b>TOTAL CARRIED FORWARD</b>                                                    |         |                                                                                                                                                                                                                                |      |          |      |        |
| ITEM                                                                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                    | UNIT | QUANTITY |      |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

|                              |  |                                                                                                                                                                                                                                                                                                                                                       |     |    |  |  |
|------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|--|--|
| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                       |     |    |  |  |
| <b>3,4</b>                   |  | <b>Motor Control Panel (6kA.sec)</b>                                                                                                                                                                                                                                                                                                                  |     |    |  |  |
| 3.4.1                        |  | Supply, delivery, installation, testing and commissioning of a 1mm Motor Control Centre, complete with busbars, switchgear, indication lamps, running/tripping/stop (on/off) selector switch, ammeter, power meter, hour meter readings, control gear. 20% spare space. Schneider / similar switchgear with switchgear coordination charts submitted. | No. | 1  |  |  |
| <b>3.5</b>                   |  | <b>Cable Trays</b>                                                                                                                                                                                                                                                                                                                                    |     |    |  |  |
|                              |  | Supply and installation of heavy duty cable tray below complete with accessories                                                                                                                                                                                                                                                                      |     |    |  |  |
| 3.5.1                        |  | 200mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                                                                                                                                                                                                                                                             | m   | 50 |  |  |
| 3.5.2                        |  | 100mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                                                                                                                                                                                                                                                             | m   | 30 |  |  |
| <b>3.6</b>                   |  | <b>Building electrical services</b>                                                                                                                                                                                                                                                                                                                   |     |    |  |  |
| 3.6.1                        |  | Surface-mounted 6kA domestic DB surge complete 60A 4P, 3x20A+E/L, 3x15A, 3x5A, 4P arrestor. 30% spare capacity.                                                                                                                                                                                                                                       | No. | 1  |  |  |
| 3.6.2                        |  | Sump facility - Indoor LED 40w weather-proof IP66                                                                                                                                                                                                                                                                                                     | No. | 2  |  |  |
| 3.6.3                        |  | Indoor LED 20w vapour-proof IP65                                                                                                                                                                                                                                                                                                                      | No. | 1  |  |  |
| 3.6.4                        |  | Outdoor LED 100W flood light IP65                                                                                                                                                                                                                                                                                                                     | No. | 4  |  |  |
| 3.6.5                        |  | Single phase welding socket out                                                                                                                                                                                                                                                                                                                       | No. | 1  |  |  |
| 3.6.6                        |  | Surface-mounted 16A domestic socket outlet                                                                                                                                                                                                                                                                                                            | No. | 4  |  |  |
| 3.6.7                        |  | Surface-mounted 40A 3ph industrial waterproof isolator with lockable handle                                                                                                                                                                                                                                                                           | No. | 2  |  |  |
| 3.6.8                        |  | Surface-mounted 30A 3ph industrial waterproof isolator with lockable handle                                                                                                                                                                                                                                                                           | No. | 2  |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                                                                                                                                                                                                                                                       |     |    |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                            | UNIT | QUANTITY |  |  |
|---------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                                                                                                                                                                                                                        |      |          |  |  |
| 3.6.9                           |         | Surface-mounted 2 lever Light switch                                                                                                                                                                                                                                                   | No.  | 1        |  |  |
| 3.6.10                          |         | 16A Photocell (Day/night) switch                                                                                                                                                                                                                                                       | No.  | 1        |  |  |
| 3.6.11                          |         | Metal conduits and fittings                                                                                                                                                                                                                                                            | m    | 200      |  |  |
| 3.6.12                          |         | 4mm2 General Purpose wires                                                                                                                                                                                                                                                             | m    | 500      |  |  |
| 3.6.13                          |         | 2.5mm2 General Purpose wires                                                                                                                                                                                                                                                           | m    | 500      |  |  |
| 3.6.14                          |         | 2.5mm2 Bare Copper Earth wires                                                                                                                                                                                                                                                         | m    | 500      |  |  |
| <b>3.7</b>                      |         | <b>Others - Testing and Commissioning</b>                                                                                                                                                                                                                                              |      |          |  |  |
|                                 |         | Making provision for the required inspection,tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks. |      |          |  |  |
| 3.7.1                           |         |                                                                                                                                                                                                                                                                                        | No   | 1        |  |  |
|                                 |         | Provisional allowance for removal and disposal of electrical components involving: storing the electrical equipment in drums/containers for hazardous waste and safely disposed at a hazardous waste site                                                                              |      |          |  |  |
| 3.7.2                           |         |                                                                                                                                                                                                                                                                                        | Sum  | 1        |  |  |
|                                 |         | Provisional allowance for Ligthning Protection system include installing surge arrestors class 2 or type 2 on the Distribution Boards as per SANS10142-1:2021 Ed.3                                                                                                                     |      |          |  |  |
| 3.7.3                           |         |                                                                                                                                                                                                                                                                                        | Sum  | 1        |  |  |
| 3.7.4                           |         | Provisional allowance for Earthing and Bonding system                                                                                                                                                                                                                                  | Sum  | 1        |  |  |
| 3.7.5                           |         | Site training of the Client's Operations staff.                                                                                                                                                                                                                                        | No   | 1        |  |  |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                                                                                                                                                                                                                        |      |          |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                 | UNIT           | QUANTITY  |  |  |
|------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|--|--|
| <b>3</b>                     |         | <b>Electrical Works (Supply and Installation of the following items)</b>                                                                                                                                                                                                                                                                                                                                    |                |           |  |  |
| <b>3,1</b>                   |         | <b>TIKWANA PUMP STATION 1</b>                                                                                                                                                                                                                                                                                                                                                                               |                |           |  |  |
|                              |         | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                     |                |           |  |  |
|                              |         | <b>Excavation and Trenching</b><br>Allowance must be made for the sifting of soil when required, removal and carting away of all stones and rocks including dumping off site. Backfilling and compaction shall be carried out as specified for overall siteworks.                                                                                                                                           |                |           |  |  |
| 3.1.1                        |         | Excavation and backfilling in soft soil                                                                                                                                                                                                                                                                                                                                                                     | m <sup>3</sup> | 10        |  |  |
| 3.1.2                        |         | Excavation and backfilling in hard rock                                                                                                                                                                                                                                                                                                                                                                     | m <sup>3</sup> | 10        |  |  |
| <b>3,2</b>                   |         | <b>Power Supply</b><br>Supply and install a power external kiosk distribution board 1500x950 mm ground-mount, 60A 3ph incomer CB, weather-proof IP65, complete with LV surge arrestors. The board will integrate a Motor Control Panel, complete with busbars, indication lamps, running/tripping/stop (on/off), selector switch, ammeter, power meter, hour meter readings, control gear. 20% spare space. | No.            | 1         |  |  |
| <b>3,3</b>                   |         | <b>Low Voltage PVC Cables, Earth Wire and Terminations</b><br>Supply and installation of PVC SWA PVC cable and Earth Wire in trenches or racking complete with terminations.                                                                                                                                                                                                                                |                |           |  |  |
| 3.3.1                        |         | 35mm <sup>2</sup> 4-core Cu PVC SWA Cable                                                                                                                                                                                                                                                                                                                                                                   | m              | Rate Only |  |  |
| 3.3.2                        |         | 16mm <sup>2</sup> 4-core Cu PVC SWA Cable (From Main Kiosk DB to new submersible raw sewage pump sets 11kW, duty and standby)                                                                                                                                                                                                                                                                               | m              | 100       |  |  |
| 3.3.3                        |         | 10mm <sup>2</sup> 4-core Cu PVC SWA Cable (From Main DB to 2.2kW inline grinder and 2.4kW dewatering pump)                                                                                                                                                                                                                                                                                                  | m              | 100       |  |  |
| 3.3.4                        |         | 10mm <sup>2</sup> 3 core Cu (LN&E) PVC SWA Cable (Kiosk DB to Kiosk Sub-DBs for outside lighting)                                                                                                                                                                                                                                                                                                           | m              | 20        |  |  |
| 3.3.5                        |         | 16mm <sup>2</sup> Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                                   | m              | Rate Only |  |  |
| 3.3.6                        |         | 10mm <sup>2</sup> Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                                   | m              | 220       |  |  |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                                                                                                                                                                                                                                                                                                             |                |           |  |  |
| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                 | UNIT           | QUANTITY  |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE  
WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| <b>TOTAL BROUGHT FORWARD</b> |  |                                                                                                                 |     |    |  |  |
|------------------------------|--|-----------------------------------------------------------------------------------------------------------------|-----|----|--|--|
| <b>3,4</b>                   |  | <b>Cable Trays</b><br>Supply and installation of heavy duty cable tray below complete with accessories          |     |    |  |  |
| 3.4.1                        |  | 200mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m   | 50 |  |  |
| 3.4.2                        |  | 100mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m   | 30 |  |  |
| <b>3,5</b>                   |  | <b>Building electrical services</b>                                                                             |     |    |  |  |
| 3.5.1                        |  | Surface-mounted 6kA domestic DB surge complete 60A 4P, 3x20A+E/L, 3x15A, 3x5A, 4P arrestor. 30% spare capacity. | No. | 1  |  |  |
| 3.5.2                        |  | Sump - Indoor LED 40w weather-proof IP66                                                                        | No. | 2  |  |  |
| 3.5.3                        |  | Indoor LED 20w vapour-proof IP65                                                                                | No. |    |  |  |
| 3.5.4                        |  | Outdoor LED 100W flood light IP65                                                                               | No. | 4  |  |  |
| 3.5.5                        |  | Single phase welding socket out                                                                                 | No. | 1  |  |  |
| 3.5.6                        |  | Surface-mounted 16A domestic socket outlet                                                                      | No. | 4  |  |  |
| 3.5.7                        |  | Surface-mounted 60A 3ph industrial waterproof isolator with lockable handle                                     | No. | 2  |  |  |
| 3.5.8                        |  | Surface-mounted 30A 3ph industrial waterproof isolator with lockable handle                                     | No. | 2  |  |  |
| <b>TOTAL CARRIED FORWARD</b> |  |                                                                                                                 |     |    |  |  |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                             | UNIT | QUANTITY |  | AMOUNT |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                                                                                                                                                                                                                         |      |          |  | -      |
| 3.6.9                           |         | Surface-mounted 2 lever Light switch                                                                                                                                                                                                                                                    | No.  | 1        |  |        |
| 3.6.10                          |         | 16A Photocell (Day/night) switch                                                                                                                                                                                                                                                        | No.  | 1        |  |        |
| 3.6.11                          |         | Metal conduits and fittings                                                                                                                                                                                                                                                             | m    | 200      |  |        |
| 3.6.12                          |         | 4mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                  | m    | 500      |  |        |
| 3.6.13                          |         | 2.5mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                | m    | 500      |  |        |
| 3.6.14                          |         | 2.5mm <sup>2</sup> Bare Copper Earth wires                                                                                                                                                                                                                                              | m    | 500      |  |        |
| <b>3.7</b>                      |         | <b>Others - Testing and Commissioning</b>                                                                                                                                                                                                                                               |      |          |  |        |
|                                 |         | Making provision for the required inspection, tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks. |      |          |  |        |
| 3.7.1                           |         |                                                                                                                                                                                                                                                                                         | No   | 1        |  |        |
|                                 |         | Provisional allowance for removal and disposal of electrical components involving: storing the electrical equipment in drums/containers for hazardous waste and safely disposed at a hazardous waste site                                                                               |      |          |  |        |
| 3.7.2                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
|                                 |         | Provisional allowance for Lightning Protection system include installing surge arrestors class 2 or type 2 on the Distribution Boards as per SANS10142-1:2021 Ed.3                                                                                                                      |      |          |  |        |
| 3.7.3                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
| 3.7.4                           |         | Provisional allowance for Earthing and Bonding system                                                                                                                                                                                                                                   | Sum  | 1        |  |        |
| 3.7.5                           |         | Site training of the Client's Operations staff.                                                                                                                                                                                                                                         | No   | 1        |  |        |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                                                                                                                                                                                                                         |      |          |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                         | UNIT | QUANTITY  |  | AMOUNT |
|------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|--|--------|
| 3                            |         | <b>Electrical Works (Supply and Installation of the following items)</b>                                                                                                                                                                                                                                                                                                            |      |           |  |        |
| 3,1                          |         | <b>TIKWANA PUMP STATION 2</b>                                                                                                                                                                                                                                                                                                                                                       |      |           |  |        |
|                              |         | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                             |      |           |  |        |
|                              |         | <b>Excavation and Trenching</b><br>Allowance must be made for the sifting of soil when required, removal and carting away of all stones and rocks including dumping off site. Backfilling and compaction shall be carried out as specified for overall siteworks.                                                                                                                   |      |           |  |        |
| 3.1.1                        |         | Excavation and backfilling in soft soil                                                                                                                                                                                                                                                                                                                                             | m³   | 10        |  |        |
| 3.1.2                        |         | Excavation and backfilling in hard rock                                                                                                                                                                                                                                                                                                                                             | m³   | 10        |  |        |
| 3,2                          |         | <b>Power Supply</b>                                                                                                                                                                                                                                                                                                                                                                 |      |           |  |        |
| 3.2.1                        |         | Supply and install a power external kiosk distribution board 1500x950 mm ground-mount, 60A 3ph incomer CB, weather-proof IP65, complete with LV surge arrestors. The board will integrate a Motor Control Panel, complete with busbars, indication lamps, running/tripping/stop (on/off), selector switch, ammeter, power meter, hour meter readings, control gear, 20% spare space | No.  | 1         |  |        |
| 3,3                          |         | <b>Low Voltage PVC Cables, Earth Wire and Terminations</b><br>Supply and installation of PVC SWA PVC cable and Earth Wire in trenches or racking complete with terminations.                                                                                                                                                                                                        |      |           |  |        |
| 3.3.1                        |         | 35mm² 4-core Cu PVC SWA Cable                                                                                                                                                                                                                                                                                                                                                       | m    | Rate Only |  |        |
| 3.3.2                        |         | 16mm² 4-core Cu PVC SWA Cable                                                                                                                                                                                                                                                                                                                                                       | m    | Rate Only |  |        |
| 3.3.3                        |         | 10mm² 4-core Cu PVC SWA Cable (From Main DB to 2.2kW inline grinder, 2.4kW dewatering pump and new 2.6kW submersible raw sewage pump sets, duty and standby                                                                                                                                                                                                                         | m    | 200       |  |        |
| 3.3.4                        |         | 10mm² 3 core Cu (LN&E) PVC SWA Cable (Kiosk DB to Kiosk Sub-DBs for outside lighting                                                                                                                                                                                                                                                                                                | m    | 20        |  |        |
| 3.3.5                        |         | 16mm² Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                       | m    | Rate Only |  |        |
| 3.3.6                        |         | 10mm² Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                       | m    | 220       |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                                                                                                                                                                                                                                                                                     |      |           |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE  
WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                     | UNIT | QUANTITY  |  | AMOUNT |
|------------------------------|---------|-----------------------------------------------------------------------------------------------------------------|------|-----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b> |         |                                                                                                                 |      |           |  |        |
| <b>3,4</b>                   |         | <b>Cable Trays</b><br>Supply and installation of heavy duty cable tray below complete with accessories          |      |           |  |        |
| 3.4.1                        |         | 200mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 50        |  |        |
| 3.4.2                        |         | 100mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 30        |  |        |
| <b>3,5</b>                   |         | <b>Building electrical services</b>                                                                             |      |           |  |        |
| 3.5.1                        |         | Surface-mounted 6kA domestic DB surge complete 60A 4P, 3x20A+E/L, 3x15A, 3x5A, 4P arrestor. 30% spare capacity. | No.  | 1         |  |        |
| 3.5.2                        |         | Sump - Indoor LED 40w weather-proof IP66                                                                        | No.  | 2         |  |        |
| 3.5.3                        |         | Indoor LED 20w vapour-proof IP65                                                                                | No.  |           |  |        |
| 3.5.4                        |         | Outdoor LED 100W flood light IP65                                                                               | No.  | 4         |  |        |
| 3.5.5                        |         | Single phase welding socket out                                                                                 | No.  | 1         |  |        |
| 3.5.6                        |         | Surface-mounted 16A domestic socket outlet                                                                      | No.  | 4         |  |        |
| 3.5.7                        |         | Surface-mounted 60A 3ph industrial waterproof isolator with lockable handle                                     | No.  | Rate Only |  |        |
| 3.5.8                        |         | Surface-mounted 30A 3ph industrial waterproof isolator with lockable handle                                     | No.  | 4         |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                 |      |           |  |        |



**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                             | UNIT | QUANTITY |  | AMOUNT |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                                                                                                                                                                                                                         |      |          |  | -      |
| 3.6.9                           |         | Surface-mounted 2 lever Light switch                                                                                                                                                                                                                                                    | No.  | 1        |  |        |
| 3.6.10                          |         | 16A Photocell (Day/night) switch                                                                                                                                                                                                                                                        | No.  | 1        |  |        |
| 3.6.11                          |         | Metal conduits and fittings                                                                                                                                                                                                                                                             | m    | 200      |  |        |
| 3.6.12                          |         | 4mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                  | m    | 500      |  |        |
| 3.6.13                          |         | 2.5mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                | m    | 500      |  |        |
| 3.6.14                          |         | 2.5mm <sup>2</sup> Bare Copper Earth wires                                                                                                                                                                                                                                              | m    | 500      |  |        |
| <b>3.7</b>                      |         | <b>Others - Testing and Commissioning</b>                                                                                                                                                                                                                                               |      |          |  |        |
|                                 |         | Making provision for the required inspection, tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks. |      |          |  |        |
| 3.7.1                           |         |                                                                                                                                                                                                                                                                                         | No   | 1        |  |        |
|                                 |         | Provisional allowance for removal and disposal of electrical components involving: storing the electrical equipment in drums/containers for hazardous waste and safely disposed at a hazardous waste site                                                                               |      |          |  |        |
| 3.7.2                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
|                                 |         | Provisional allowance for Lightning Protection system include installing surge arrestors class 2 or type 2 on the Distribution Boards as per SANS10142-1:2021 Ed.3                                                                                                                      |      |          |  |        |
| 3.7.3                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
| 3.7.4                           |         | Provisional allowance for Earthing and Bonding system                                                                                                                                                                                                                                   | Sum  | 1        |  |        |
| 3.7.5                           |         | Site training of the Client's Operations staff.                                                                                                                                                                                                                                         | No   | 1        |  |        |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                                                                                                                                                                                                                         |      |          |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                 | UNIT | QUANTITY  | AMOUNT |
|------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|--------|
| 3                            |         | <b>Electrical Works (Supply and Installation of the following items)</b>                                                                                                                                                                                                                                                                                                                                    |      |           |        |
| 3,1                          |         | <b>TIKWANA PUMP STATION 3</b>                                                                                                                                                                                                                                                                                                                                                                               |      |           |        |
|                              |         | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                     |      |           |        |
|                              |         | <b>Excavation and Trenching</b><br>Allowance must be made for the sifting of soil when required, removal and carting away of all stones and rocks including dumping off site. Backfilling and compaction shall be carried out as specified for overall siteworks.                                                                                                                                           |      |           |        |
| 3.1.1                        |         | Excavation and backfilling in soft soil                                                                                                                                                                                                                                                                                                                                                                     | m³   | 10        |        |
| 3.1.2                        |         | Excavation and backfilling in hard rock                                                                                                                                                                                                                                                                                                                                                                     | m³   | 10        |        |
| 3,2                          |         | <b>Power Supply</b><br>Supply and install a power external kiosk distribution board 1500x950 mm ground-mount, 60A 3ph incomer CB, weather-proof IP65, complete with LV surge arrestors. The board will integrate a Motor Control Panel, complete with busbars, indication lamps, running/tripping/stop (on/off), selector switch, ammeter, power meter, hour meter readings, control gear. 20% spare space. |      |           |        |
| 3.2.1                        |         |                                                                                                                                                                                                                                                                                                                                                                                                             | No.  | 1         |        |
| 3,3                          |         | <b>Low Voltage PVC Cables, Earth Wire and Terminations</b><br>Supply and installation of PVC SWA PVC cable and Earth Wire in trenches or racking complete with terminations.                                                                                                                                                                                                                                |      |           |        |
| 3.3.1                        |         | 35mm² 4-core Cu PVC SWA Cable (From Main DB to new distribution board)                                                                                                                                                                                                                                                                                                                                      | m    | Rate Only |        |
| 3.3.2                        |         | 16mm² 4-core Cu PVC SWA Cable                                                                                                                                                                                                                                                                                                                                                                               | m    | Rate Only |        |
| 3.3.3                        |         | 10mm² 4-core Cu PVC SWA Cable (From Main DB to 2.2kW inline grinder, 2.4kW dewatering pump and new 1.2kW submersible raw sewage pump sets, duty and standby                                                                                                                                                                                                                                                 | m    | 200       |        |
| 3.3.4                        |         | 10mm² 3 core Cu (LN&E) PVC SWA Cable (Kiosk DB to Kiosk Sub-DBs for outside lighting                                                                                                                                                                                                                                                                                                                        | m    | 20        |        |
| 3.3.5                        |         | 16mm² Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                                               | m    | Rate Only |        |
| 3.3.6                        |         | 10mm² Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                                               | m    | 220       |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                                                                                                                                                                                                                                                                                                             |      |           |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE  
WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                     | UNIT | QUANTITY  |  | AMOUNT |
|------------------------------|---------|-----------------------------------------------------------------------------------------------------------------|------|-----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b> |         |                                                                                                                 |      |           |  |        |
| <b>3,4</b>                   |         | <b>Cable Trays</b><br>Supply and installation of heavy duty cable tray below complete with accessories          |      |           |  |        |
| 3.4.1                        |         | 200mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 50        |  |        |
| 3.4.2                        |         | 100mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 30        |  |        |
| <b>3,5</b>                   |         | <b>Building electrical services</b>                                                                             |      |           |  |        |
| 3.5.1                        |         | Surface-mounted 6kA domestic DB surge complete 60A 4P, 3x20A+E/L, 3x15A, 3x5A, 4P arrestor. 30% spare capacity. | No.  | 1         |  |        |
| 3.5.2                        |         | Sump - Indoor LED 40w weather-proof IP66                                                                        | No.  | 2         |  |        |
| 3.5.3                        |         | Indoor LED 20w vapour-proof IP65                                                                                | No.  |           |  |        |
| 3.5.4                        |         | Outdoor LED 100W flood light IP65                                                                               | No.  | 4         |  |        |
| 3.5.5                        |         | Single phase welding socket out                                                                                 | No.  | 1         |  |        |
| 3.5.6                        |         | Surface-mounted 16A domestic socket outlet                                                                      | No.  | 4         |  |        |
| 3.5.7                        |         | Surface-mounted 60A 3ph industrial waterproof isolator with lockable handle                                     | No.  | Rate Only |  |        |
| 3.5.8                        |         | Surface-mounted 30A 3ph industrial waterproof isolator with lockable handle                                     | No.  | 4         |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                 |      |           |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                             | UNIT | QUANTITY |  | AMOUNT |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                                                                                                                                                                                                                         |      |          |  |        |
| 3.6.9                           |         | Surface-mounted 2 lever Light switch                                                                                                                                                                                                                                                    | No.  | 1        |  |        |
| 3.6.10                          |         | 16A Photocell (Day/night) switch                                                                                                                                                                                                                                                        | No.  | 1        |  |        |
| 3.6.11                          |         | Metal conduits and fittings                                                                                                                                                                                                                                                             | m    | 200      |  |        |
| 3.6.12                          |         | 4mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                  | m    | 500      |  |        |
| 3.6.13                          |         | 2.5mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                | m    | 500      |  |        |
| 3.6.14                          |         | 2.5mm <sup>2</sup> Bare Copper Earth wires                                                                                                                                                                                                                                              | m    | 500      |  |        |
| <b>3.7</b>                      |         | <b>Others - Testing and Commissioning</b>                                                                                                                                                                                                                                               |      |          |  |        |
|                                 |         | Making provision for the required inspection, tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks. |      |          |  |        |
| 3.7.1                           |         |                                                                                                                                                                                                                                                                                         | No   | 1        |  |        |
|                                 |         | Provisional allowance for removal and disposal of electrical components involving: storing the electrical equipment in drums/containers for hazardous waste and safely disposed at a hazardous waste site                                                                               |      |          |  |        |
| 3.7.2                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
|                                 |         | Provisional allowance for Lightning Protection system include installing surge arrestors class 2 or type 2 on the Distribution Boards as per SANS10142-1:2021 Ed.3                                                                                                                      |      |          |  |        |
| 3.7.3                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
| 3.7.4                           |         | Provisional allowance for Earthing and Bonding system                                                                                                                                                                                                                                   | Sum  | 1        |  |        |
| 3.7.5                           |         | Site training of the Client's Operations staff.                                                                                                                                                                                                                                         | No   | 1        |  |        |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                                                                                                                                                                                                                         |      |          |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                | UNIT | QUANTITY  | AMOUNT |
|------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|--------|
| <b>3</b>                     |         | <b>Electrical Works (Supply and Installation of the following items)</b>                                                                                                                                                                                                                                                                                                                                   |      |           |        |
| <b>3,1</b>                   |         | <b>TIKWANA PUMP STATION 5</b>                                                                                                                                                                                                                                                                                                                                                                              |      |           |        |
|                              |         | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                                                                                                                                                                    |      |           |        |
|                              |         | <b>Excavation and Trenching</b><br>Allowance must be made for the sifting of soil when required, removal and carting away of all stones and rocks including dumping off site. Backfilling and compaction shall be carried out as specified for overall siteworks.                                                                                                                                          |      |           |        |
| 3.1.1                        |         | Excavation and backfilling in soft soil                                                                                                                                                                                                                                                                                                                                                                    | m³   | 10        |        |
| 3.1.2                        |         | Excavation and backfilling in hard rock                                                                                                                                                                                                                                                                                                                                                                    | m³   | 10        |        |
| <b>3,2</b>                   |         | <b>Power Supply</b><br>Supply and install a power external kiosk distribution board 1500x950 mm ground-mount, 60A 3ph incomer CB, weather-proof IP65, complete with LV surge arrestors. The board will integrate a Motor Control Panel, complete with busbars, indication lamps, running/tripping/stop (on/off), selector switch, ammeter, power meter, hour meter readings, control gear, 20% spare space |      |           |        |
| 3.2.1                        |         |                                                                                                                                                                                                                                                                                                                                                                                                            | No.  | 1         |        |
| <b>3,3</b>                   |         | <b>Low Voltage PVC Cables, Earth Wire and Terminations</b><br>Supply and installation of PVC SWA PVC cable and Earth Wire in trenches or racking complete with terminations.                                                                                                                                                                                                                               |      |           |        |
| 3.3.1                        |         | 35mm² 4-core Cu PVC SWA Cable (From Main DB to new distribution board)                                                                                                                                                                                                                                                                                                                                     | m    | Rate Only |        |
| 3.3.2                        |         | 16mm² 4-core Cu PVC SWA Cable                                                                                                                                                                                                                                                                                                                                                                              | m    | Rate Only |        |
| 3.3.3                        |         | 10mm² 4-core Cu PVC SWA Cable (From Main DB to 2.2kW inline grinder, 2.4kW dewatering pump and new 2.4kW submersible raw sewage pump sets, duty and standby                                                                                                                                                                                                                                                | m    | 200       |        |
| 3.3.4                        |         | 10mm² 3 core Cu (LN&E) PVC SWA Cable (Kiosk DB to Kiosk Sub-DBs for outside lighting)                                                                                                                                                                                                                                                                                                                      | m    | 20        |        |
| 3.3.5                        |         | 16mm² Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                                              | m    | Rate Only |        |
| 3.3.6                        |         | 10mm² Cu Insulated Earth Wire                                                                                                                                                                                                                                                                                                                                                                              | m    | 220       |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                                                                                                                                                                                                                                                                                                            |      |           |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE  
WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                     | UNIT | QUANTITY  |  | AMOUNT |
|------------------------------|---------|-----------------------------------------------------------------------------------------------------------------|------|-----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b> |         |                                                                                                                 |      |           |  |        |
| <b>3,4</b>                   |         | <b>Cable Trays</b><br>Supply and installation of heavy duty cable tray below complete with accessories          |      |           |  |        |
| 3.4.1                        |         | 200mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 50        |  |        |
| 3.4.2                        |         | 100mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 30        |  |        |
| <b>3,5</b>                   |         | <b>Building electrical services</b>                                                                             |      |           |  |        |
| 3.5.1                        |         | Surface-mounted 6kA domestic DB surge complete 60A 4P, 3x20A+E/L, 3x15A, 3x5A, 4P arrestor. 30% spare capacity. | No.  | 1         |  |        |
| 3.5.2                        |         | Sump - Indoor LED 40w weather-proof IP66                                                                        | No.  | 2         |  |        |
| 3.5.3                        |         | Indoor LED 20w vapour-proof IP65                                                                                | No.  |           |  |        |
| 3.5.4                        |         | Outdoor LED 100W flood light IP65                                                                               | No.  | 4         |  |        |
| 3.5.5                        |         | Single phase welding socket out                                                                                 | No.  | 1         |  |        |
| 3.5.6                        |         | Surface-mounted 16A domestic socket outlet                                                                      | No.  | 4         |  |        |
| 3.5.7                        |         | Surface-mounted 60A 3ph industrial waterproof isolator with lockable handle                                     | No.  | Rate Only |  |        |
| 3.5.8                        |         | Surface-mounted 30A 3ph industrial waterproof isolator with lockable handle                                     | No.  | 4         |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                 |      |           |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                             | UNIT | QUANTITY |  | AMOUNT |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                                                                                                                                                                                                                         |      |          |  |        |
| 3.6.9                           |         | Surface-mounted 2 lever Light switch                                                                                                                                                                                                                                                    | No.  | 1        |  |        |
| 3.6.10                          |         | 16A Photocell (Day/night) switch                                                                                                                                                                                                                                                        | No.  | 1        |  |        |
| 3.6.11                          |         | Metal conduits and fittings                                                                                                                                                                                                                                                             | m    | 200      |  |        |
| 3.6.12                          |         | 4mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                  | m    | 500      |  |        |
| 3.6.13                          |         | 2.5mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                | m    | 500      |  |        |
| 3.6.14                          |         | 2.5mm <sup>2</sup> Bare Copper Earth wires                                                                                                                                                                                                                                              | m    | 500      |  |        |
| <b>3.7</b>                      |         | <b>Others - Testing and Commissioning</b>                                                                                                                                                                                                                                               |      |          |  |        |
|                                 |         | Making provision for the required inspection, tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks. |      |          |  |        |
| 3.7.1                           |         |                                                                                                                                                                                                                                                                                         | No   | 1        |  |        |
|                                 |         | Provisional allowance for removal and disposal of electrical components involving: storing the electrical equipment in drums/containers for hazardous waste and safely disposed at a hazardous waste site                                                                               |      |          |  |        |
| 3.7.2                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
|                                 |         | Provisional allowance for Lightning Protection system include installing surge arrestors class 2 or type 2 on the Distribution Boards as per SANS10142-1:2021 Ed.3                                                                                                                      |      |          |  |        |
| 3.7.3                           |         |                                                                                                                                                                                                                                                                                         | Sum  | 1        |  |        |
| 3.7.4                           |         | Provisional allowance for Earthing and Bonding system                                                                                                                                                                                                                                   | Sum  | 1        |  |        |
| 3.7.5                           |         | Site training of the Client's Operations staff.                                                                                                                                                                                                                                         | No   | 1        |  |        |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                                                                                                                                                                                                                         |      |          |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                       | UNIT           | QUANTITY  |  | AMOUNT |
|------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|--|--------|
| 3                            |         | Electrical Works (Supply and Installation of the following items)                                                                                                                                                                                                 |                |           |  |        |
| 3,1                          |         | <b>TIKWANA PUMP STATION 6</b>                                                                                                                                                                                                                                     |                |           |  |        |
|                              |         | <i>The Tenderer must read the drawings &amp; specifications when pricing this Bill.</i>                                                                                                                                                                           |                |           |  |        |
|                              |         | <b>Excavation and Trenching</b><br>Allowance must be made for the sifting of soil when required, removal and carting away of all stones and rocks including dumping off site. Backfilling and compaction shall be carried out as specified for overall siteworks. |                |           |  |        |
| 3.1.1                        |         | Excavation and backfilling in soft soil                                                                                                                                                                                                                           | m <sup>3</sup> | 3         |  |        |
| 3.1.2                        |         | Excavation and backfilling in hard rock                                                                                                                                                                                                                           | m <sup>3</sup> | 3         |  |        |
| 3,2                          |         | <b>Power Supply</b><br>Supply and install a power external main distribution board 500x850mm wall-mounted, with 150A 3ph incomer CB, weather-proof IP65, complete with LV surge arrestors, and introduce a 40A 3ph CB to feed power to the 5.5kW inline grinder   |                |           |  |        |
| 3.2.1                        |         |                                                                                                                                                                                                                                                                   | No.            | 1         |  |        |
| 3,3                          |         | <b>Low Voltage PVC Cables, Earth Wire and Terminations</b><br>Supply and installation of PVC SWA PVC cable and Earth Wire in trenches or racking complete with terminations.                                                                                      |                |           |  |        |
| 3.3.1                        |         | 35mm <sup>2</sup> 4-core Cu PVC SWA Cable                                                                                                                                                                                                                         | m              | Rate Only |  |        |
| 3.3.2                        |         | 16mm <sup>2</sup> 4-core Cu PVC SWA Cable                                                                                                                                                                                                                         | m              | Rate Only |  |        |
| 3.3.3                        |         | 10mm <sup>2</sup> 4-core Cu PVC SWA Cable (From Main DB to 2.2kW inline grinder)                                                                                                                                                                                  | m              | 100       |  |        |
| 3.3.4                        |         | 10mm <sup>2</sup> 3 core Cu (LN&E) PVC SWA Cable (Kiosk DB to Kiosk Sub-DBs for outside lighting                                                                                                                                                                  | m              | Rate Only |  |        |
| 3.3.5                        |         | 16mm <sup>2</sup> Cu Insulated Earth Wire                                                                                                                                                                                                                         | m              | Rate Only |  |        |
| 3.3.6                        |         | 10mm <sup>2</sup> Cu Insulated Earth Wire                                                                                                                                                                                                                         | m              | 100       |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                                                                                                                                                                   |                |           |  |        |



**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE  
WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                     | UNIT | QUANTITY  |  | AMOUNT |
|------------------------------|---------|-----------------------------------------------------------------------------------------------------------------|------|-----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b> |         |                                                                                                                 |      |           |  |        |
| <b>3,4</b>                   |         | <b>Cable Trays</b><br>Supply and installation of heavy duty cable tray below complete with accessories          |      |           |  |        |
| 3.4.1                        |         | 200mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | Rate Only |  |        |
| 3.4.2                        |         | 100mm width 1.5mm thickness heavy duty cable tray, complete with fittings                                       | m    | 8         |  |        |
| <b>3,5</b>                   |         | <b>Building electrical services</b>                                                                             |      |           |  |        |
| 3.5.1                        |         | Surface-mounted 6kA domestic DB surge complete 60A 4P, 3x20A+E/L, 3x15A, 3x5A, 4P arrestor. 30% spare capacity. | No.  |           |  |        |
| 3.5.2                        |         | Sump - Indoor LED 40w weather-proof IP66                                                                        | No.  | Rate Only |  |        |
| 3.5.3                        |         | Indoor LED 20w vapour-proof IP65                                                                                | No.  | Rate Only |  |        |
| 3.5.4                        |         | Outdoor LED 100W flood light IP65                                                                               | No.  | Rate Only |  |        |
| 3.5.5                        |         | Single phase welding socket out                                                                                 | No.  | Rate Only |  |        |
| 3.5.6                        |         | Surface-mounted 16A domestic socket outlet                                                                      | No.  | Rate Only |  |        |
| 3.5.7                        |         | Surface-mounted 60A 3ph industrial waterproof isolator with a lockable handle                                   | No.  | Rate Only |  |        |
| 3.5.8                        |         | Surface-mounted 30A 3ph industrial waterproof isolator with lockable handle with lockable handle                | No.  | 1         |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                 |      |           |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                            | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                             | UNIT | QUANTITY  |  | AMOUNT |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|--|--------|
| <b>TOTAL BROUGHT FORWARD</b>    |         |                                                                                                                                                                                                                                                                                         |      |           |  |        |
| 3.6.9                           |         | Surface-mounted 2 lever Light switch                                                                                                                                                                                                                                                    | No.  | Rate Only |  |        |
| 3.6.10                          |         | 16A Photocell (Day/night) switch                                                                                                                                                                                                                                                        | No.  | Rate Only |  |        |
| 3.6.11                          |         | Metal conduits and fittings                                                                                                                                                                                                                                                             | m    | Rate Only |  |        |
| 3.6.12                          |         | 4mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                  | m    | Rate Only |  |        |
| 3.6.13                          |         | 2.5mm <sup>2</sup> General Purpose wires                                                                                                                                                                                                                                                | m    | Rate Only |  |        |
| 3.6.14                          |         | 2.5mm <sup>2</sup> Bare Copper Earth wires                                                                                                                                                                                                                                              | m    | Rate Only |  |        |
| <b>3.7</b>                      |         | <b>Others - Testing and Commissioning</b>                                                                                                                                                                                                                                               |      |           |  |        |
|                                 |         | Making provision for the required inspection, tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks. |      |           |  |        |
| 3.7.1                           |         |                                                                                                                                                                                                                                                                                         | No   |           |  |        |
|                                 |         | Provisional allowance for removal and disposal of electrical components involving: storing the electrical equipment in drums/containers for hazardous waste and safely disposed at a hazardous waste site                                                                               | Sum  | 1         |  |        |
| 3.7.2                           |         |                                                                                                                                                                                                                                                                                         |      |           |  |        |
|                                 |         | Provisional allowance for Lightning Protection system include installing surge arrestors class 2 or type 2 on the Distribution Boards as per SANS10142-1:2021 Ed.3                                                                                                                      | Sum  | 1         |  |        |
| 3.7.3                           |         |                                                                                                                                                                                                                                                                                         |      |           |  |        |
| 3.7.4                           |         | Provisional allowance for Earthing and Bonding system                                                                                                                                                                                                                                   | Sum  | 1         |  |        |
| 3.7.5                           |         | Site training of the Client's Operations staff.                                                                                                                                                                                                                                         | No   | 1         |  |        |
| <b>TOTAL CARRIED TO SUMMARY</b> |         |                                                                                                                                                                                                                                                                                         |      |           |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

| ITEM                         | PAYMENT | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | UNIT | QUANTITY |  | AMOUNT |
|------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|--|--------|
| 3                            |         | Electrical Works (Supply and Installation of the following items)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |          |  |        |
| 3,1                          |         | <b>WASTE WATER TREATMENT PLANT EQUIPMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |          |  |        |
|                              |         | <i>Replacement of the following items</i><br><i>Supply and install, including testing and commissioning of the following items</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |          |  |        |
| 3.1.1                        |         | Replace a 3 x soft starters for 45kW Aerators at the Bio-Reactor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | No.  | 3        |  |        |
| 3,2                          |         | <b>Control and Instrumentation Works</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |          |  |        |
| 3.2.1                        |         | Provisional sum of 300,000 for repair/replace of PLC system, including CPU, I/O modules (digital and analogue), communication modules, DIN-rail power supplies, SD card, monitoring accessories, and all associated wiring and terminal components. Configuration of the HMI and testing of all communication links between the HMI, the main PLC, and any interlinked PLCs (via Wi-Fi or other existing media). Full system commissioning in collaboration with the Client's representative. Handover of all project documentation, PLC software, configuration files, and backups upon final completion. | Sum  | 1        |  |        |
| 3,3                          |         | <b>Others - Testing and Terminations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |          |  |        |
|                              |         | Making provision for the required inspection, tests and the commissioning of the tests and the commissioning of the complete installation and the issuing of the required certificates and handover documentation (test sheets, manuals, software, etc) including electronic datapacks.                                                                                                                                                                                                                                                                                                                    | No.  | 1        |  |        |
| <b>TOTAL CARRIED FORWARD</b> |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |          |  |        |

**RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND  
TIKWANA**

Section 4: Civil and Structural

| ITEM NO                      | DESCRIPTION                                                                                                                                                  | UNIT           | QTY | RATE | AMOUNT |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----|------|--------|
| 1                            | <b>DEMOLITIONS AND REMOVAL</b>                                                                                                                               |                |     |      |        |
| 1.1                          | <u><b>External fence and gate</b></u>                                                                                                                        |                |     |      |        |
| 1.1.1                        | Existing wire fence approx 1,5 to 2m high                                                                                                                    | m              | 300 |      |        |
| 1.1.2                        | Gate approximately 4,50m wide including concrete base                                                                                                        | No             | 6   |      |        |
| 1.2                          | <u><b>Existing gantry structure</b></u>                                                                                                                      |                |     |      |        |
| 1.2.1                        | Existing steel columns including bases                                                                                                                       | No             | 12  |      |        |
| 1.2.2                        | Existing steel beam                                                                                                                                          | No             | 6   |      |        |
| 2                            | <b>EARTHWORKS</b>                                                                                                                                            |                |     |      |        |
| 2.1                          | <u><b>Site preparation clear and strip site</b></u>                                                                                                          |                |     |      |        |
| 2.1.1                        | Clear site including vegetation, etc                                                                                                                         | m <sup>2</sup> | 900 |      |        |
| 2.1.2                        | Remove topsoil to a depth of 150mm and stockpile on site within freehaul distance                                                                            | m <sup>3</sup> | 135 |      |        |
| 2.1.3                        | Excavations for chambers                                                                                                                                     | m <sup>3</sup> | 102 |      |        |
| 3                            | <b>INLET MANHOLE</b>                                                                                                                                         |                |     |      |        |
| 3.1                          | Breaking into and connecting into existing manhole                                                                                                           | No.            | 6   |      |        |
|                              | <u><b>Supply and install manholes &amp; slabs (SABS 1294)</b></u>                                                                                            |                |     |      |        |
| 3.2                          | Precast concrete manholes 1200mm diameter, exceeding 1250mm and not exceeding 1500mm deep, complete with precast concrete heavy duty cover and frame TYPE 4A | No.            | 12  |      |        |
| 4                            | <b>CONCRETE (STRUCTURAL)</b>                                                                                                                                 |                |     |      |        |
| 4.1                          | <b>FORMWORK</b>                                                                                                                                              |                |     |      |        |
|                              | <u><b>Provide for the fabrication, erection, use and dismantling of formwork for</b></u>                                                                     |                |     |      |        |
|                              | <u><b>Rough formwork to</b></u>                                                                                                                              |                |     |      |        |
| 4.1.1                        | Inside of chamber and gantry footings                                                                                                                        | m <sup>2</sup> | 60  |      |        |
|                              | <u><b>Smooth formwork to</b></u>                                                                                                                             |                |     |      |        |
| 4.1.2                        | Sides of chamber                                                                                                                                             | m <sup>2</sup> | 48  |      |        |
| 4.1.3                        | Edges of walls, slabs, forming openings in walls, etc. not exceeding 300mm wide or high                                                                      | m              | 30  |      |        |
| <b>Total Carried Forward</b> |                                                                                                                                                              |                |     |      |        |

RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND  
TIKWANA

Section 4: Civil and structural

| ITEM NO                | DESCRIPTION                                                                                                                                   | UNIT | QTY  | RATE | AMOUNT |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|--------|
| Amount brought forward |                                                                                                                                               |      |      |      |        |
| 4.2                    | <b>REINFORCEMENT</b>                                                                                                                          |      |      |      |        |
|                        | <u>Mild Steel</u>                                                                                                                             |      |      |      |        |
| 4.2.1                  | Bars not exceeding 16mm diameter                                                                                                              | t    | 0,20 |      |        |
|                        | <u>High Tensile Steel</u>                                                                                                                     |      |      |      |        |
| 4.2.2                  | Bars not exceeding 16mm diameter                                                                                                              | t    | 0,60 |      |        |
| 4.3                    | <b>CONCRETE</b>                                                                                                                               |      |      |      |        |
|                        | <u>Concrete Class 20MPa/19mm in</u>                                                                                                           |      |      |      |        |
| 4.3.1                  | Blinding                                                                                                                                      | m³   | 0,6  |      |        |
|                        | <u>Strength reinforced concrete Class 25MPa/19mm in</u>                                                                                       |      |      |      |        |
| 4.3.2                  | Bases, walls and roof                                                                                                                         | m³   | 6    |      |        |
| 4.3.3                  | Bases                                                                                                                                         | m³   | 4    |      |        |
| 4.4                    | <b>EXPANSION / ISOLATION JOINTS</b>                                                                                                           |      |      |      |        |
|                        | <u>Expansion joints, including all intersections and necessary formwork, holes, etc.</u>                                                      |      |      |      |        |
| 4.4.1                  | Form expansion joint with 10mm thick high density foam board between vertical concrete and brickwork surfaces not exceeding 300mm high / wide | m    | 36   |      |        |
| 5                      | <b>OUTLET CHAMBER</b>                                                                                                                         |      |      |      |        |
| 5.1                    | <u>Composite manhole cover</u>                                                                                                                |      |      |      |        |
| 5.1.1                  | Cover to suit opening 800 x 1000mm including bedding on concrete (galvanised mild steel frame elsewhere)                                      | No   | 6    |      |        |
| 5.1.2                  | Cover suit opening 1400 x 1400mm including bedding on concrete (galvanised mild steel frame elsewhere)                                        | No   | 6    |      |        |
| 5.1.3                  | Extra for hinges                                                                                                                              | pair | 24   |      |        |
| 5.1.4                  | Extra for latch                                                                                                                               | No   | 12   |      |        |
| Total Carried Forward  |                                                                                                                                               |      |      |      |        |

RETROFITTING OF 6 SEWER PUMP STATIONS, INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND  
TIKWANA

Section 4: Civil and Structural

| ITEM NO                                                        | DESCRIPTION                                                                                                                     | UNIT | QTY  | RATE | AMOUNT |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------|------|------|--------|
| Amount brought forward                                         |                                                                                                                                 |      |      |      |        |
| 6                                                              | <b><u>METALWORK:</u></b>                                                                                                        |      |      |      |        |
| 6.1                                                            | <b><u>Hot dipped galvanised manhole frames</u></b>                                                                              |      |      |      |        |
| 6.1.1                                                          | 75 x 50 x 8mm Frames epoxied in position                                                                                        | t    | 0,20 |      |        |
| 6.2                                                            | <b><u>Gantries</u></b>                                                                                                          |      |      |      |        |
|                                                                | <b><u>Hot dipped galvanised mild steel columns and beams including baseplates, gussets, etc.</u></b>                            |      |      |      |        |
| 6.2.1                                                          | 152 x 152 x 23kg/m H-section columns                                                                                            | t    | 0,30 |      |        |
| 6.2.2                                                          | 152 x 152 x 23kg/m H-section beams                                                                                              | t    | 0,10 |      |        |
| 6.3                                                            | <b><u>Erection bolts to structural steel and concrete, etc.</u></b>                                                             |      |      |      |        |
| 6.3.1                                                          | Graded 8,8 bolts, nuts and washers                                                                                              | t    | 0,02 |      |        |
| 6.3.2                                                          | 16mm Chemical anchors                                                                                                           | No   | 16   |      |        |
| 6.3.3                                                          | 20mm Chemical anchors                                                                                                           | No   | 16   |      |        |
| 7                                                              | <b><u>PALISADE FENCE</u></b>                                                                                                    |      |      |      |        |
| 7.1                                                            | <b><u>Erect 2,05m High hot dipped galvanised palisade fence</u></b>                                                             |      |      |      |        |
| 7.1.1                                                          | Palisade fence with palisades at not exceeding 125mm centres in 3m wide panels with posts                                       | m    | 300  |      |        |
| 7.1.2                                                          | Extra over posts for 100 x 100mm corner or gate posts 2,6m long in concrete 450 x 450 x 600mm                                   | No   | 48   |      |        |
| 7.1.3                                                          | Pedestrian gate to suit opening 1,0m wide                                                                                       | No   | 6    |      |        |
| 7.1.4                                                          | Sliding gate 4,5m wide including guides, bottom track in concrete, etc.                                                         | No   | 6    |      |        |
| 8                                                              | <b><u>HOISTING EQUIPMENT</u></b>                                                                                                |      |      |      |        |
| 8.1                                                            | <b><u>Design, manufacture, factory test and deliver hoisting equipment, including fixing detail</u></b>                         |      |      |      |        |
| 8.1.1                                                          | Manual hoisting equipment, block and chain, plus slings and beam cradle installed <u>permanently</u> . Safe Working Load 3 tons | No   | 5    |      |        |
| 9                                                              | <b><u>ROOF SLAB</u></b>                                                                                                         |      |      |      |        |
| 9.1                                                            | <b><u>Allow for lifting and re-alignment of existing 8 tons slabs</u></b>                                                       |      |      |      |        |
| 9.1.1                                                          | Lift and remove roof slabs and re-position to required angle on the same sump. Safe Working Load 8 tons                         | No   | 4    |      |        |
| <b><u>TOTAL COST FOR CIVIL/STRUCTURAL WORKS (EXCL VAT)</u></b> |                                                                                                                                 |      |      |      |        |

## **PART C3**

### **SCOPE OF WORK**

**C3 SCOPE OF WORK**

**C3.1 DESCRIPTION OF WORKS**

- The Contractor to be appointed will undertake the full scope of work which comprises the retrofitting of 6 sewer pump stations and repairs of waste water treatment plant.
- **Mechanical Scope of Work** – Rehabilitate the mechanical existing installation. Two submersible raw sewage pump sets (pumps and motors), would be installed to replace existing pump sets. The new pumps will be configured as one duty pump and one standby pump, which roles will be rotated amongst the two pumps, to achieve equitable hours of operation throughout their life cycle.
- For the purpose of the pump selections we have considered the requirements to be one pump on duty and the second on standby.
- Repair and replace mechanical existing equipment.
- **Civil and Structural** – Rehabilitation of the civil and structural integrity of the sump, chamber, and Wastewater Treatment Works (WWTW) building facilities, including the installation of new steel palisade fencing and the construction of new manholes to accommodate inline grinder installations.
- **Electricity Scope of Work** – Rehabilitate the electrical existing equipment including LV cabling and small power and lighting. Install DoL motors and automation of the pumping system and upgrade the MCPs (motor control Panels). Repair and replace PLC system and installation of 3 x soft starters for 45kW Aerators at the Bio-reactor.

**C3.1.1 LOCATION OF WORKS**

Location of Sites:

The sites of the works are the existing at Hoopstaad and Tikwana pump stations, which are situated along R700 provincial road between Bloemfontein and the North West Province. The main town is Hoopstad and its township is Tikwana.

**C3.1.2 NATURE OF WORKS**

The description of the project contained in this section is merely an outline of the contract works and shall not limit the work to be carried out by the Contractor under this contract. Approximate quantities of each type of work to be carried out in accordance with the contract documents are listed in the Bill of Quantities bound in this volume.



**C3.1.3 SCOPE**

**C3.1.3.1 Mechanical Scope of Work**

**Scope Statement**

*Replacement, installation, and commissioning of mechanical equipment and associated ancillary systems for 6 sewer pump stations and repairs of waste watertreatment plant. The scope of facilities and activities includes but is not limited to the following items:*

Install low lift equipment comprising:

- Two submersible raw sewage pump sets (pumps and motors), would be installed to replace existing pump sets. The new pumps will be configured as one duty pump and one standby pump, which roles will be rotated amongst the two pumps, to achieve equitable hours of operation throughout their life cycle. high lift pump sets (pumps and motors), would be installed to replace existing pump sets. The new pumps will be configured as one duty pump and one standby pump, which roles will be rotated amongst the two pumps, to achieve equitable hours of operation throughout their life cycle.
- a. For the purpose of the pump selections we have considered the requirements to be one pump on duty and the second on standby.
- b. Installation of inline grinders;
- c. Suction side and delivery side pipework, complete with fittings;
- d. Suction and delivery side isolating valves;
- e. Non-return valves;
- f. Electromagnetic flowmeter;
  - Pump protection probes, comprising no flow switches, pressure switches, vibration probes; temperature probes; and related control wiring to the MCPs;
  - Painting and demarcation of floors; and
  - Plinths for each low lift pump.

**Waste Water Treatment Plant**

- a. Repair/replace of the Berson Ultraviolet unit in the treated effluent pump station;
- b. Repair/replace Mechanical Screen;
- c. Replace 2 x 5.5 kw mixers at the Bio-Reactor;
- d. Replacement of 2 x Kw Aerators at the Bio-Reactor;
- e. Replace a close couple 1 x 45 Kw pump in the Golf-club pump station;
- f. Installation of new complete Drive Cage Assembly for the clarifiers;
- g. Replacement of Centre bearings (clarifiers); and
- h. Re-alignment of the Scum Skimmer with the Scum Box (clarifiers).

i.

#### **C3.1.3.2 Civil and Building Scope of Work**

##### **Scope Statement**

*Replacement, installation, and commissioning of civil and building infrastructure for 6 sewer pump stations and repairs of waste watertreatment plant. The scope of facilities and activities includes but is not limited to the following items:*

- a) Repairs of the existing inlet and outlet chambers for various manholes;
- b) Pump station building rehabilitation and upgrade works;
- c) Construction of new manholes to accommodate inline grinders installations;
- d) New installation of steel palisade fencing;
- e) Clear and grub within site boundary;
- f) Reconfigure roof slab layout for ease of access/maintenance; and
- g) Install gantry structures and hoisting equipment

#### **C3.1.3.3 Electrical, Control and Instrumentation Scope of Work**

##### **Scope Statement**

*Replacement, installation, and commissioning of Electrical and C&I equipment associated ancillary systems for 6 sewer pump stations and repairs of waste watertreatment plant. The scope of facilities and activities includes but not limited to the following items:*

- h) Installation of a new 630kVA pole-mounted;
- i) Installation of new motor supply cables, LV cables;
- j) Supply, rigging into position and commissioning of new low lift pump sets ;
- k) Installation of supply cables to new pumps;
- l) Supply and installation of cable trays;
- m) Pump efficiency measurement and monitoring;
- n) Installation pump stations electrical services
- o) Testing and commissioning of the entire installation;
- p) Training of the staff; and
- q) Issuing certificate of compliance according SANS 10142.

##### **Waste Water Treament Plant**

- r) Installation of 3 x soft starters for 45 Aerators at the Bio-Reactor;
- s) Repair/replace of PLC system, including CPU, I/O modules (digital and analogue), communication modules, DIN-rail power supplies, SD card, monitoring

accessories, and all associated wiring and terminal components. Configuration of the HMI and testing of all communication links between the HMI, the main PLC, and any interlinked PLCs (via Wi-Fi or other existing media). Full system commissioning in collaboration with the Client's representative. Handover of all project documentation, PLC software, configuration files, and backups upon final completion.

**C3.1.4 TIME FOR COMPLETION**

The construction period for this project is estimated to take 6 months.

**C3.1.5 GENERAL INFORMATION**

**C3.1.5.1 Drawings**

The reduced drawings contained in C5 that form part of the tender document shall be used for tender purposes only. Further drawings are to be provided on an on-going basis by the engineer.

Any information in the possession of the contractor, which the resident engineer requires to complete the as-built drawings, shall be supplied to the resident engineer before a certificate of completion will be issued.

Only figured dimensions shall be used and drawings shall not be scaled unless so instructed by the engineer. The engineer will supply all figured dimensions omitted from the drawings.

**C3.1.5.2 Power, Water Supply and Other Services**

The contractor shall make his own arrangements concerning the supply of electrical power and all other services. No direct payment will be made for the provision of electrical and other services. The cost of providing these services will be deemed to be included in the rates and amounts tendered for the various items of work for which these services are required.

**C3.1.5.3 Contractor's Camp Site and Security**

The contractor shall make his own arrangements regarding the establishment of a camp site and housing for his construction personnel and all regulations stipulated by the local authority shall be adhered to.

It is anticipated that the contractor's choice of a camp site will be influenced by the availability of telephone and electrical connections as well as the supply of potable water. Provision is made in these specifications for the erection of a security fence around the site offices. The contractor shall be responsible for the security of his personnel and constructional plant on and around the site of the works and for the security of his camp, and the employer will consider no claims in this regard.

**C3.1.5.4 Additional Requirements for Construction Activities**

C3.1.5.4.1 The contractor may not commence constructional activities before adequate provision has been made to accommodate traffic in accordance with the requirements of this document and the South African Road Traffic Signs Manual.

C3.1.5.4.2 The contractor shall submit proposals in connection with directional signs to the engineer for approval.

**C3.1.5.5 Programme Requirements for Construction Activities**

C3.1.5.5.1 The contractor shall programme his activities to be suitable in terms of his resources to complete the contract inside the stipulated time period.

**C3.1.5.6 Construction in Confined Areas**

It may be necessary for the contractor to work in confined areas. The method of construction in these confined areas depends on the contractor's construction plant. However, the contractor must note that measurement and payment will be in accordance with the specified cross-sections and dimensions, irrespective of the method used to achieve these cross-sections and dimensions, and that the rates and amounts tendered will be deemed to include full compensation for any special equipment or construction methods or for any difficulty encountered in working in confined areas and narrow widths, and at or around obstructions, and that no extra payment will be made nor will any claim for payment be considered on account of these difficulties.

**C3.1.6 BARRICADING OF EXCAVATIONS**

All excavations in close proximity to pedestrian and vehicular traffic are to be barricaded to the satisfaction of the Engineer. Barricading shall consist of a minimum of two strands of parallel and horizontal wire of at least 2mm gauge, the topmost strand being fixed at least 1m above ground level. These wires shall be fixed to the approved fence posts, which shall be securely fixed in a vertical position.

The visibility of these barricades shall be enhanced by the attachment of high visibility construction tape to the posts and wire strands and by the placing of reflective signing to the Engineer's satisfaction. All costs arising from these requirements are to be included in the tendered rates for excavation.

**C3.1.7 CONTINUITY OF WATER SUPPLY**

It is an important aspect of this project to keep the plant in operation. Thus, continuous water supply to the final consumer must take preference to any construction action affecting the supply of water, i.e.

- The water supply may only be stopped intermittently (4 hours per day) at a time, but with one week's written notice to the Engineer and his subsequent approval after consulting with the Client prior to a shutdown. The main criteria for consideration will be the percentage of full water capacity of the main service reservoirs.
- The Contractor will have to continually co-ordinate his operation concerning the water

availability and usage with the Resident Engineer on site.

**C3.1.8 ENGINEERING**

**C3.1.8.1 DESIGN**

C3.1.8.1.1 The Employer is responsible for the design of the permanent Works as reflected in these Contract Documents unless otherwise stated.

C3.1.8.1.2 The Contractor is responsible for the design of the temporary Works and their compatibility with the permanent Works.

C3.1.8.1.3 The Contractor shall supply all details necessary to assist the engineer in the compilation of the as-built drawings.

C3.1.8.1.4 Employer's Design  
Detail Description of Works  
(General Works)

C3.1.8.1.5 Contractor's Design  
Where contractor is to supply the design of designated parts of the permanent Works or temporary Works he shall supply full working drawings supported by a professional engineer's design certificate.

**C3.1.8.2 DESIGN PROCEDURES**

All designs and modifications thereto shall be communicated in writing and the contractor and engineer shall maintain master lists to record and track all transactions.

**C3.1.8.3 EQUIVALENCY OF STANDARDS AND CODES**

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Engineer's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 7 days prior to the date when the Contractor desires the Engineer's approval. In the event the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards specified in the documents.

## **C3.2 STANDARD SPECIFICATIONS**

**C3.2 STANDARD SPECIFICATIONS – MECHANICAL, ELECTRICAL, CONTROL AND INSTRUMENTATION ENGINEERING**

The following ISO and SANS electromechanical specifications shall apply for the construction of the works:

| <b>ID</b> | <b>Standard ID</b> | <b>Title</b>                                                                                             |
|-----------|--------------------|----------------------------------------------------------------------------------------------------------|
| 1         | BS 159             | Bus bars                                                                                                 |
| 2         | BS 89              | Ammeters                                                                                                 |
| 3         | BS 3938            | Current Transformers                                                                                     |
| 4         | BS 639             | Welding cables                                                                                           |
| 5         | ISO 5210:1991      | Industrial valves -- Multi-turn valve actuator attachments                                               |
| 6         | ISO 5211:2001      | Industrial valves - Part-turn actuator attachments                                                       |
| 7         | ISO9905:1994       | Technical specifications for centrifugal pumps                                                           |
| 8         | NRS 002 -          | Graphical symbols for electrical power, telecommunications and electronic diagrams                       |
| 9         | NRS 029            | Current Transformer                                                                                      |
| 10        | SANS 10142-1:2012  | The Wiring of Premises, Part 1: Low-voltage installations                                                |
| 11        | SANS 10292         | Earthing of low voltage distribution systems                                                             |
| 12        | SANS 1091          | Paint Colour                                                                                             |
| 13        | SANS 119           | Bus bars                                                                                                 |
| 14        | SANS 1213 -        | Mechanical cable glands                                                                                  |
| 15        | SANS 1433-1        | Terminal blocks having screws and screw less terminals                                                   |
| 16        | SANS 1433-2        | Flat push-on connectors                                                                                  |
| 17        | SANS 1473-1        | Low voltage switchgear and control gear assemblies: Type-tested and partially type-tested assemblies     |
| 18        | SANS 1473-2        | Low voltage switchgear and control gear assemblies: Bus bar trunking systems.                            |
| 19        | SANS 156           | Moulded Case Circuit Breakers                                                                            |
| 20        | SANS 1574          | Electric cables and flexible cords                                                                       |
| 21        | SANS 1576          | Welding cables                                                                                           |
| 22        | SANS 1619          | Small power distribution units (ready boards) for single-phase 230 V service connections.                |
| 23        | SANS 1765          | Safety of distribution boards                                                                            |
| 24        | SANS 60044         | Current Transformers                                                                                     |
| 25        | SANS 60439-2       | Low voltage switchgear and control gear assemblies: particular requirements for bus bar trunking systems |



| <b>ID</b> | <b>Standard ID</b> | <b>Title</b>                                                                                                      |
|-----------|--------------------|-------------------------------------------------------------------------------------------------------------------|
| 26        | SANS 60439-4       | Low voltage switchgear and control gear assemblies: particular requirements for assemblies for construction sites |
| 27        | SANS 60947-2       | Low voltage switchgear and control gear: Circuit breakers                                                         |
| 28        | SANS 60947-3       | Low voltage switchgear and control gear: switches and disconnects                                                 |
| 29        | SANS 60947-4-1     | Low voltage switchgear and control gear: Contractors and motor starters (Electromechanical)                       |
| 30        | SANS 60947-4-2     | Low voltage switchgear and control gear: Contractors and motor starters (semiconductor motor controller)          |
| 31        | SANS 60947-4-3     | Low voltage switchgear and control gear: Contractors and motor starters (for non-motor loads)                     |
| 32        | SANS 60947-5.1     | Low voltage switchgear and control gear: Electromechanical control circuit devices                                |
| 33        | SANS 60947-5.2     | Low voltage switchgear and control gear: Electrical emergency stop device with mechanical latching function       |
| 34        | SANS 62-1:2013     | Steel pipes Part 1: Pipes suitable for threading and of nominal size not exceeding 150 mm                         |
| 35        | SANS 62-2:2013     | Steel pipes Part 2: Screwed pieces and pipe fittings of nominal size not exceeding 150 mm                         |
| 36        | SANS 664-1:2011    | Wedge gate and resilient seal valves for waterworks Part 1: General                                               |
| 37        | SANS 664-1:2011    | Wedge gate and resilient seal valves for waterworks Part 2: Wedge gate valves                                     |
| 38        | SANS 719:2011      | Electric welded low carbon steel pipes for aqueous fluids (large bore)                                            |
| 39        | SANS 767           | Earth leakage protection units                                                                                    |

## **C 3.3 TECHNICAL SPECIFICATIONS – MECHANICAL WORKS**

**C3.3 TECHNICAL SPECIFICATIONS – MECHANICAL WORKS**

**C3.3.1 CONTRACTOR'S ESTABLISHMENT ON SITE AND GENERAL CHARGES**

**C3.3.1.1 SCOPE**

The Tenderer shall allow under Schedule 1 for all preliminary and general charges associated with the Contract as a whole and shall thus include the relevant charges associated with any/all sub-contractors and suppliers appointed under the Contract.

**C3.3.1.2 NOTICES, SIGNS AND ADVERTISEMENTS**

The Tenderer shall allow for the supply and erection of one (1No) contract notice board in terms of the issued drawing. The notice board shall be erected at a suitable location as confirmed by the Engineer.

**C3.3.1.3 COMPLIANCE WITH OCCUPATIONAL HEALTH AND SAFETY ACT, ITS REGULATIONS AND THE EMPLOYER'S HEALTH AND SAFETY SPECIFICATION**

The Tenderer shall refer to relevant sections included within this document for the Employer's Health and Safety Specification and shall make adequate allowance in the tendered fixed and time-related rates for compliance to the said Specification.

**C3.3.1.4 COMPLIANCE WITH ENVIRONMENTAL MANAGEMENT PLAN**

The Tenderer shall refer to relevant sections included within this document for the applicable Environmental Management Plan (EMP) and shall make adequate allowance in the time-related rates for compliance to the said Specification during the period of installation on Site.

**C3.3.2 SCOPE**

**C3.3.2.1 Hoopstaad Commando**

| ID | Item                          | Specification                                |
|----|-------------------------------|----------------------------------------------|
| 1  | <b>Type</b>                   | Submersible – Duck foot type<br>(Guide Rail) |
| 2  | Capacity (m <sup>3</sup> /hr) | 51.84                                        |
| 3  | Head (m)                      | 13.97                                        |
| 4  | Pump Speed (rpm)              | 1450                                         |
| 5  | Motor Size                    | 3.5 kW, 400 V, 4 Pole                        |
| 6  | Impeller                      | Stainless steel                              |
| 7  | Shaft                         | Chrome steel                                 |

**Table 1 Hoopstaad Commando**

**C3.3.2.2 Tikwana No.1**

| ID | Item                          | Specification                                |
|----|-------------------------------|----------------------------------------------|
| 1  | Type                          | Submersible – Duck foot type<br>(Guide Rail) |
| 2  | Capacity (m <sup>3</sup> /hr) | 122.4                                        |
| 3  | Head (m)                      | 21.37                                        |
| 4  | Pump Speed (rpm)              | 2925                                         |
| 5  | Motor Size                    | 11 kW, 400 V, 4 Pole                         |
| 6  | Impeller                      | Stainless steel                              |
| 7  | Shaft                         | Chrome steel                                 |

**Table 2 Tikwana No.1**

**C3.3.2.3 Tikwana No.2**

| ID | Item                          | Specification                                |
|----|-------------------------------|----------------------------------------------|
| 1  | Type                          | Submersible – Duck foot type<br>(Guide Rail) |
| 2  | Capacity (m <sup>3</sup> /hr) | 59.4                                         |
| 3  | Head (m)                      | 8.54                                         |
| 4  | Pump Speed (rpm)              | 2760                                         |
| 5  | Motor Size                    | 2.6 kW, 400 V, 4 Pole                        |
| 6  | Impeller                      | Stainless steel                              |
| 7  | Shaft                         | Chrome steel                                 |

**Table 3 Tikwana No.2**

**C3.3.2.4 Tikwana No.3**

| ID | Item                          | Specification                             |
|----|-------------------------------|-------------------------------------------|
| 1  | Type                          | Submersible – Duck foot type (Guide Rail) |
| 2  | Capacity (m <sup>3</sup> /hr) | 30.924                                    |
| 3  | Head (m)                      | 7.55                                      |
| 4  | Pump Speed (rpm)              | 2905                                      |
| 5  | Motor Size                    | 1.2 kW, 400 V, 4 Pole                     |
| 6  | Impeller                      | Stainless steel                           |
| 9  | Shaft                         | Chrome steel                              |

**Table 4 Tikwana No.3**

**C3.3.2.5 Tikwana No.5**

| ID | Item                          | Specification                             |
|----|-------------------------------|-------------------------------------------|
| 1  | Type                          | Submersible – Duck foot type (Guide Rail) |
| 2  | Capacity (m <sup>3</sup> /hr) | 48.24                                     |
| 3  | Head (m)                      | 11.1                                      |
| 5  | Pump Speed (rpm)              | 1450                                      |
| 6  | Motor Size                    | 2.4 kW, 400 V, 4 Pole                     |
| 7  | Impeller                      | Stainless steel                           |
| 8  | Shaft                         | Chrome steel                              |

**Table 5 Tikwana No.5**

**C3.3.2.6 Dewatering pumps for all stations**

| ID | Item                          | Specification         |
|----|-------------------------------|-----------------------|
| 1  | Type                          | Submersible           |
| 2  | Capacity (m <sup>3</sup> /hr) | 34.2                  |
| 3  | Head (m)                      | 9.5                   |
| 5  | Pump Speed (rpm)              | 1450                  |
| 6  | Motor Size                    | 1.2 kW, 400 V, 4 Pole |
| 7  | Impeller                      | Stainless steel       |
| 8  | Shaft                         | Chrome steel          |

**Table 6 Dewatering pumps for all stations**



### C3.3.3.1 FLOW METERS

Each flow meter supplied under this contract shall be equipped with separate mountable signal converter unit complete with sufficient length of signal cable. The signal converter shall be locally programmable and shall be supplied complete with programmer unit. The signal converter shall furthermore have a LCD display for instantaneous flow and totalize flow and shall have a 4-20mA and pulsed output for remote indications. The signal converter unit will be mounted in an outdoor type cubicle.

### C3.3.3.2 Electromagnetic flow meters

The following meter(s) shall be supplied and installed:

- a) LLPS delivery side magflow meter Operating range: (0 - 300 l/s)

Each flow meter shall be able to record reverse flow.

### C3.3.4 VALVE CONSTRUCTION AND OPERATIONAL REQUIREMENTS

#### Bodies

Hubs for shaft-bearing housings shall form an integral part of the valve body.

Valves bodies shall have adjustable mechanical stops to prevent over travel of the valve disc in the open or closed position. These stops may be incorporated in an actuator.

#### Discs

Discs shall be a single casting of approved hydrofoil section with a smooth continuous surface. The maximum combined stresses in the disc shall not exceed 20% of the minimum yield stress of the material used when the specified unbalanced pressure is applied on any of the two sides.

#### Retaining Rings

Stainless steel retaining rings shall be coated to reduce galvanic corrosion (Refer to Standard Specification DWS 9900 Section C3). Any recess for the retaining ring in the disc or body shall be coated and the retaining rings assembled whilst the coating is still wet.

#### Seats and Seals

Preference shall be given to resilient seal arrangements that are removable, replaceable and adjustable from the downstream side of the valve, without having to remove the valve from the pipeline.

Resilient seals shall have non-weathering, non-sticking, long life properties and shall be compatible with the quality of water to be conveyed.

The seat profile shall be smooth and continuous and shall provide adequate "lead in" for the resilient seal to open and to close on the stainless steel seat only.

Seats and seals shall be of a design that would prevent them from becoming loose and obviate water seepage under the seals or seats during all conditions of operation and test.

#### Shafts

Shafts can either be continuous or a stub-shaft design configuration. Stub shafts shall extend into the disc hub for a distance of at least 1.5 shaft diameters and shall not protrude from the hubs i.e. exposing the shaft.

Shafts shall be attached to discs by means of keys, dowel pins, taper pins or any combination of the three and the connection shall be designed to transmit shaft torque equivalent to at least 75% of the torsional strength of the shaft. Dowel and taper pins shall be mechanically secured.

#### **Bearings**

Self-lubricating sleeve type bearings shall be fitted in the hubs in the valve body.

Each valve shall be fitted with at least one adjustable thrust bearing set to hold the disc securely concentric with the body or seat.

#### **C3.3.4.1 Non-return valves**

Non-return valves at pump stations shall be of a tilted disc type

| <b>ID</b> | <b>Item</b>              | <b>Specification</b>                |
|-----------|--------------------------|-------------------------------------|
| 1         | Type                     | Tilted Disc                         |
| 2         | Body                     | SG Iron or Cast Steel               |
| 3         | Disc Material            | Cast Steel BS 1504-161              |
| 4         | Disc Seat Material       | Stainless Steel, Grade 308          |
| 5         | Body Seat Material       | Stainless Steel, Grade 304L         |
| 6         | Stroke of Operation      | Not more than 40 degrees            |
| 7         | Dashpot                  | Not required                        |
| 8         | Valve Position Indicator | Yes                                 |
| 9         | Pressure rating          | PN25                                |
| 10        | Flanges                  | To SANS 1123                        |
| 11        | End cover O-ring         | Nitrile Rubber 70 NBR               |
| 12        | Corrosion Protection     | Fusion Bonded Epoxy, to 150 microns |

**Table 7 Non-return Valve Specifications**

#### **C3.3.4.2 Wedge Gate valves (delivery)**

| <b>ID</b> | <b>Item</b>          | <b>Specification</b>                      |
|-----------|----------------------|-------------------------------------------|
| 1         | Body                 | SG Iron or Cast Steel                     |
| 2         | Spindle              | Stainless Steel, Rising type              |
| 3         | Gate Nut             | Bronze                                    |
| 4         | Body Seat            | Stainless Steel, Grade 304L               |
| 6         | Gate Seat            | Stainless Steel, Grade 316                |
| 7         | Pressure rating      | PN25                                      |
| 8         | Flanges              | To SANS 1123                              |
| 9         | Corrosion Protection | Fusion Bonded Epoxy (FBE), to 150 microns |

**Table 8 Wedge Gate Valves (Delivery Side of Pumps)**





#### C3.3.4.3 Wedge Gate Valves (Suction Side of Pumps)

Technical specifications for wedge gate valves on the suction side of pumps are listed hereunder.

| ID | Item                 | Specification                             |
|----|----------------------|-------------------------------------------|
| 1  | Body                 | SG Iron                                   |
| 2  | Spindle              | Stainless Steel, Rising type              |
| 3  | Gate Nut             | Bronze                                    |
| 4  | Body Seat            | Stainless Steel, Grade 304L               |
| 6  | Gate Seat            | Stainless Steel, Grade 316                |
| 7  | Pressure rating      | PN10                                      |
| 8  | Flanges              | To SANS 1123                              |
| 9  | Corrosion Protection | Fusion Bonded Epoxy (FBE), to 150 microns |

**Table 9 Wedge Gate Valves (Suction Side of Pumps)**

#### C3.3.4.4 Pump Control Valves

Pump control valves shall meet specifications that are listed in the schedule below.

| ID | Item                | Specification                                                                                                                     |
|----|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1  | Type                | Hydraulically operated, diaphragm-actuated, active check valve that opens fully or shuts off in response to electric signals      |
| 2  | Body                | Ductile Iron, Globe Valve, Angle Pattern Design                                                                                   |
| 3  | Fail safe mechanism | Yes                                                                                                                               |
| 4  | Double chamber      | Yes                                                                                                                               |
| 4  | Operation           | Hydraulic, electric and Spring operated, for start-up control, normal shutdown control, as well as power failure shutdown control |
| 5  | Control System      | 3-way solenoid pilot, check valves, limit switch, isolating cock valves                                                           |
| 6  | Seat                | Replaceable, raised stainless steel ring seat                                                                                     |
| 7  | Flow Patch          | Unobstructed                                                                                                                      |
| 8  | Actuator            | Double-chamfered with an inherent separating partition                                                                            |
| 9  | Valve shaft         | Stainless Steel                                                                                                                   |
| 10 | Pressure Rating     | PN25                                                                                                                              |
| 11 | Flange              | To SANS 1123                                                                                                                      |
|    | Internals           | Stainless Steel and Brass                                                                                                         |

| ID | Item       | Specification                        |
|----|------------|--------------------------------------|
| 12 | Elastomers | NBR (Acrylonitrile butadiene rubber) |

**Table 10 Pump Control Valves**

|    |                                       |                          |
|----|---------------------------------------|--------------------------|
| 19 | Integral heater to avoid condensation | Yes                      |
| 20 | LED Indicators (colour-coded)         | Open, Closed and Failure |

**Table 11 Actuator Specifications**

### C3.3.5 SCHEDULE OF EQUIPMENT AND MATERIALS OFFERED (MECHANICAL EQUIPMENT)

#### C3.3.5.1 Low Lift Pumps

Pump Designation

Manufacturer

Type of Centrifugal Pump

Number of Stages

Make

Model Number

Speed (RPM)

Power Requirements (V/ph/A/kW)

Mass (kg)

Power Consumed at duty point (kW)

Country of origin

Delivery lead time (sea freight)

Delivery lead time (air freight)

Is there a workshop to repair pump in South Africa?  
TSWELOPELE LOCAL MUNICIPALITY may need to  
verify this information.

Are there technicians to effect repairs and to provide  
after sales service in South Africa?

Name reference sites where similar pumps are installed in South Africa

| Site | Year installed | Contact Person and Tel No. |
|------|----------------|----------------------------|
| a.   |                |                            |
| b.   |                |                            |
| c.   |                |                            |
| d.   |                |                            |

Pump Performance

One Duty Pump

|                                 |              |
|---------------------------------|--------------|
| Duty point flow specified (l/s) | <b>91.45</b> |
| Duty point head specified (m)   | <b>190.5</b> |
| Duty point flow offered (l/s)   |              |
| Duty point head offered (m)     |              |
| Hydraulic efficiency (%)        |              |
| Overall efficiency (%)          |              |
| NPSH <sub>R</sub> (m)           |              |

## **C 3.4 TECHNICAL SPECIFICATIONS – ELECTRICAL WORKS**

**C3.4 TECHNICAL SPECIFICATIONS – ELECTRICAL, CONTROL AND INSTRUMENTATION WORKS**

**PREAMBLE**

**AMENDMENTS TO THE STANDARD AND PARTICULAR SPECIFICATIONS (PROJECT SPECIFICATIONS – ELECTRICAL, CONTROL AND INSTRUMENTATION WORKS)**

**INDEX**

|            |                                       |
|------------|---------------------------------------|
| <b>MSS</b> | <b>MINIATURE SUBSTATIONS</b>          |
| <b>MCC</b> | <b>MOTOR CONTROL CENTRES</b>          |
| <b>EC</b>  | <b>ELECTRICAL CABLES</b>              |
| <b>EDS</b> | <b>ELECTRICAL DISTRIBUTION SYSTEM</b> |
| <b>TMS</b> | <b>TELEMETRY SYSTEMS</b>              |
| <b>PLC</b> | <b>PROGRAMMABLE LOGIC CONTROLLERS</b> |
| <b>UPS</b> | <b>UN-INTERRUPTED POWER SUPPLY</b>    |

**C3.4.1 MINIATURE SUBSTATIONS**

No miniature substation shall be required.

**C3.4.2 MOTOR CONTROL CENTRES AND DISTRIBUTION BOARDS**

**INDEX**

| <b>ITEM</b> | <b>DESCRIPTION</b>                                                                                               |
|-------------|------------------------------------------------------------------------------------------------------------------|
| MCC 01      | SCOPE                                                                                                            |
| MCC 02      | CONDITIONS TO SERVICE                                                                                            |
| MCC 03      | STANDARDS AND TESTS                                                                                              |
| MCC 04      | CONSTRUCTION                                                                                                     |
| MCC 05      | GENERAL REQUIREMENTS                                                                                             |
| MCC 06      | MOTOR STARTERS AND ACCESSORIES FOR SWITCHBOARDS                                                                  |
| MCC 07      | DANGER SIGN                                                                                                      |
| MCC 08      | ELECTRONIC LEVEL CONTROL                                                                                         |
| MCC 09      | EMERGENCY STOP PUSH BUTTONS AND WEATHERPROOF ISOLATORS                                                           |
| MCC 10      | EARTHING                                                                                                         |
| MCC 11      | INFORMATION TO BE SUBMITTED WITH TENDERS IN RESPECT OF THE 400 VOLT DISTRIBUTION BOARDS AND MOTOR CONTROL BOARDS |
| MCC 12      | INFORMATION TO BE SUBMITTED BY THE SUCCESSFUL TENDERER                                                           |
| MCC 13      | INSPECTIONS AND TESTS                                                                                            |
| MCC 14      | TESTING OF DISTRIBUTION/MOTR CONRTOL BOARDS AT THE MANUFACTURER'S WORKS                                          |
| MCC 15      | CONCRETE PLINTHS FOR OUTDOOR STARTER PANELS AND PEDESTALS                                                        |
| MCC 16      | INSTALLATION OF DISTRIBUTION BOARDS AND MOTOR CONTROL BOARDS                                                     |
| MCC 17      | TESTING AND COMMISSIONING OF DISTRIBUTION/MOTOR CONTROL BOARDS AFTER INSTALLATION ON SITE                        |
| MCC 18      | OPERATING AND MAINTENANCE INSTRUCTIONS                                                                           |
| MCC 19      | MEASUREMENT AND PAYMENT                                                                                          |

**C3.4.2.1 MCC 01: SCOPE**

This specification includes the design, manufacturing, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability Period.

The following information regarding the switch- and distribution boards shall be submitted with each tender

- a) The name and address of the switchboard manufacture.
- b) Full technical details and descriptive literature regarding all equipment and instruments offered.
- c) Three paper prints of an outline drawing of each board indicating the main overall dimensions and general lay-out of the boards; and
- d) Three paper prints of an outline drawing of the front end processor cabinet indicating the main overall dimensions, general layout and type of material employed on the face of the panel.

**C3.4.2.2 MCC 02: CONDITIONS TO SERVICE**

The motor control centres shall be installed indoors and outdoors on an industrial plant.

**C3.4.2.3 MCC 03: STANDARDS AND TESTS**

The motor control centres shall conform to and be in accordance with the latest applicable South African Bureau of Standards Codes and Standards.

**C3.4.2.4 MCC 04: CONSTRUCTION**

Distribution and motor control boards with a short-circuit withstand current rating of 10kA and higher shall comply with all type test requirements by either self-certification by the manufacturer, type test certification of the manufacturers must be submitted, or by means of a Certificate of Compliance issued by an accredited person for type-tested assemblies.

The board shall be of the free standing floor mounted cubicle type with IP 55 insect proofed enclosure, constructed of at least 2 mm steel on a rigid channel iron or similar frame, and shall be bolted down in position by means of M16 high tensile stainless steel bolts grouted into the concrete floor of the pump station building. The bolts shall be inside the board.

The overall height of the board shall not exceed 2400mm and overall depth shall not be less than 450mm and shall not exceed 600mm. The construction of the board shall be such that future extension panels may be fitted on both sides and alterations can be done without major changes to the board. (Modular construction will be preferred.)

The board shall be provided with readily removable covers on the sides and hinged panels on the front.

All removable covers shall be suitably braced and reinforced to ensure rigidity.

All hinged panels shall be reinforced to ensure rigidity and shall be provided with heavy duty rust proof hinges.

Each door shall be supplied with completely hinges, each fastened with not less than four (two on each side) brass bolts and nuts. In the case of double doors the first door shall be locked with two slides on the inside, onto the kiosk shell. The second door shall close over a drip proof gutter shaped lip on the first one.



The doors shall be provided with a locking system suitable for padlocking. The locking system shall consist of a 3 way locking mechanism locking the door at the top, middle and bottom.

All switchgear, instruments and equipment for the control of any specific motor or other electrical device shall be mounted flush behind a common hinged panel, with only operating handles, push buttons and instrument faces protruding through neatly machine punched holes in the panel.

Motor starter panes shall be a segregated system with each motor starter housed in a separate panel complete with door interlocked main switch. Where motor starter panels are installed on top of a common cable marshalling panel. Provision shall be made for pre-wiring between the starter panel and cable connectors inside cable marshalling panel to facilitate site cable connections.

The board shall be provided with readily removable, sectionalized, rigidly supported unpainted 3 CR12 cable end support gland plates along the entire length of the board and at least 230mm above floor level.

Space shall be provided for future switchgear and equipment where specified.

The board shall be suitably sized to accommodate without cramping, all the switchgear and equipment specified.

Screwed-on engraved labels in English shall be provided below all switchgear and equipment on and in the panels to facilitate identification.

The board shall be provided with one set of four solid, copper bus bars in the top section and extending over the entire length of the board. Provision shall be made at the end of each bus bar for future extensions.

Bus bars shall comply with the requirements of BSS 1433 and the relevant clauses of BSS 159.

Bus bars shall be rigidly supported at suitable intervals to prevent undue damage resulting under short circuit conditions. Ceramic or other approved bus bar insulators shall be used. The bus bar shall be arranged horizontally with the longer sides of the cross-sections in the vertical plane and one behind the other, in the horizontal plane, at 90 mm centres.

Bus bars shall be clearly and indelibly marked in the middle of the bus bar Red, White and Blue for the three phases and Black for Neutral.

Connections to bus bars shall be effected by means of cable lugs and suitably sized cadmium-plated, high tensile steel bolts and nuts with cadmium-plated cup washers or lock washers. Spare connections shall be provided complete with bolts, nuts, washers and spring washers.

All screws, studs, bolts, nuts and washers used for these boards shall be Cadmium plated. The use of self-tapping screws will not be permissible. A solid copper earth bar shall be provided inside the board above the gland plate along the entire length of the board.

The earth bar shall have a cross-section of at least 150mm depending on the main bus bar sizes.

The earth bars shall be drilled and provide with 6mm dia and 10mm dia cadmium plated, high tensile steel bolts and nuts, complete with cadmium-plated washers and cup washers

or lock washers for making the earth connections. The earthing positions shall be evenly spaced along the entire length of each bus bar.

The outdoor motor control boards shall be constructed of at least 2mm powder coated 3CR12 steel complying with the specification for indoor boards, but shall be not more than 1500mm high. Vermin proofed IP 54 rated ventilation openings shall be provided in doors and side panels.

Where electronic equipment such as transmitting I/O units are incorporated in an outdoor distribution and motor control board, this equipment shall be installed in a separate and special compartment and all wiring shall be terminated on rail mounted terminal strips for field connection of all monitoring and control cables.

This compartment shall if necessary consist of an outer and inner shell with at least 10mm insulation or polystyrene between the inner and outer shell all round to keep the temperature inside the compartment at least 5 degree C below the temperature surrounding the compartment in summer complete with ventilation fans.

The doors of this compartment must be labelled "Electronic Equipment"

Sufficient provision for breathing and heat dissipation must be made in this compartment.

#### **C3.4.2.5 MCC 05: GENERAL REQUIREMENTS**

##### **Internal Wiring**

The internal wiring of the boards shall consist of coloured PVC –insulated conductors of adequate copper cross-section, which shall be neatly installed horizontally and vertically in PVC trunking. Numbered ferrules of an approved type (clip on type not acceptable), shall be provided on each end of each wire to facilitate the tracing of circuits.

Control circuit shall be colour coded as follows:

|                     |                  |
|---------------------|------------------|
| A.C Live            | Red              |
| A.C. Neutral        | Black            |
| 110 V D.C Positive  | Grey             |
| 110 V D.C. Negative | Grey             |
| 24 V D.C +ve        | Brown            |
| 24 V D.C –ve        | Orange           |
| 4-20mA              | Purple           |
| All other voltages  | Violet           |
| Status Signals      | Pink             |
| Earth               | Green and yellow |

##### **Electronic Equipment**

Where electronic equipment such as transmitting I/O units are incorporated in a distribution – and motor control board, this equipment shall be installed in a separate and special compartment.

Sufficient room shall be provided for all rail mounted terminal strips and all wiring shall be terminated on these rail mounted terminal strips for field connection of all monitoring and control cables.

The door must be labelled "ELECTRONIC EQUIPMENT"

#### **Cable Terminations**

Cable terminations shall be suitable to accommodate the cable or cables for each circuit as specified. This applies not only to the number of cores, size and conductor material, but also to the type and construction of the cables.

Cable terminations shall be complete with the necessary clamps, glands, terminating and other accessories. Heat shrink cable ends must be complete with all accessories.

Mechanical cable glands for control and auxiliary cables shall be suitable for PVC/PVC/SWA/PVC type cables. The armouring shall be clamped firmly to ensure reasonably good electrical connection and to prevent the cables from being pulled out easily. Each gland shall be complete with a neoprene shroud and one locknut.

#### **Labelling of Switchboards and Motor Control Boards**

A screwed on engraved label of the black and white "trefolite" type shall be provided below each item of equipment of the front panel of each board as well as on the chassis in close proximity to the relevant equipment to identify such equipment in the English language in 6mm high lettering.

Each board shall further be provided with a screwed on reverse engraved yellow Perspex nameplate with black 20mm high lettering to identify the board in the English language on the outside of the door at the top thereof.

#### **Motor starter panels**

All metal parts shall be treated before powder coating in accordance with standard corrosion protection standards and the appropriate coating system shall be selected for the specific application. Motor control centre outer surfaces shall be powder coated colour B26, SANS 1091. (Electric orange)

### **C3.4.2.6 Mcc 06: MOTOR STARTERS AND ACCESSORIES FOR SWITCHBOARDS**

#### **Direct- on- line starters (380 V motors)**

These starters shall be of the manually operated (locally and remotely) type and each starter shall be contained in its own separate compartment on the relevant motor control board.

Each of these units shall comprise amongst other the following components:

- a) 1 Only mains fused switch/circuit breaker connected to the bus bars of the board and interlocked with the door of the compartment to prevent opening of the door with the switch closed and to prevent closing of the switch with the door open.
- a) 1 Set of HRC control fused links with carriers and basis where necessary;
- b) All necessary relays as required.
- c) 1 Only mains contractor
- d) 1 Set of START and STOP push buttons
- e) 1 Only mains operated timing device to limit starts per hour; and

- f) 1 Only power factor correction capacitor unit for motors of 5kW and more.

The following protective and indicating devices complete with the necessary suitably rated potential fuses, current transformers, test blocks and auxiliary relays:

- a) 1 Only electronic type motor protection relay for motors of 7, 5kW or more or as specified
- b) 1 Only motor under current relay (Where specified)
- c) 1 Only instantaneous indicating ammeter for motor current
- d) 1 Only ammeter selector switch for motors of 5kW or ore
- e) 3 Only Current transformers for motors of 5kW or more;
- f) 1 Only running hour meter;
- g) 1 Only anti-cycle timer and
- h) 1 Only thermister relay for motors of 22kW or more
- i) 1 Only Start delay timer for motors of 15kW and higher
- j) 1 Only blue LED type indicator light to indicate the time delayed starting period.
- k) 4 Only LED type indicator light as follows "Supply on Green – Motor Running ; Amber Motor Tripped and blue – Motor start delay red Emergency stop engaged.

It shall further be possible trip and lock out the starter by means of a remote stop button to be provided at the relevant motor.

Provision shall also be made for locking the mains fused switch handle in the OFF position

#### **Star/Delta Starters (380 V motors)**

These starters shall be of the automatic star/delta type and each starter shall be contained in its own separate compartment on the relevant motor control board.

Each of these units shall comprise amongst others provided for direct on line starters the following components as:

- a) 1 Only Mains Contactor
- b) 1 Only Star Contactor
- c) Only Delta Contactor
- d) 1 Only Star to Delta timer of the clockwork or electromagnetic type
- e) 1 Only Mains operated timing device to limit the starts per hour
- f) 1 Set START and STOP pushbuttons
- g) 1 Only Three phase Power Factor Correction Capacitor unit for motors of 5kW or more
- h) All necessary relays

#### **Variable Speed Drives**

These variable speed drives shall each be contained in its own separate panel, manufactured and equipped to the satisfaction of the variable speed drive manufacturer to suit their own requirements with regard to ventilation of the variable speed drive. Small drives below 1kW can be combined into one panel but sufficient ventilation by means of extractor fans must always be allowed for.

The variable speed drive panel shall be equipped with ventilation fans and air filters. The ventilation fan shall be interlocked with the relevant motor and shall only be in operation when the motor is running. Failure of the ventilation fan shall stop the motor and a visible indication of the cause of the failure shall be provided on the panel.

The frequency converter shall make use of flux vector control without encoder or tachogenerator feedback and shall incorporate direct torque control technology so that the overall effectiveness of the drive shall only be limited by the performance of the motor.

Semi-conductor switching shall be determined by the values of flux and torque and shall not have a predetermined pattern as in conventional pulse width modulation flux vector drives.

Each of these drives shall comprise amongst other the following components:

- a) 1 Only main isolator/circuit breaker that shall be interlocked with the door of the panel to prevent opening of the door with the switch closed and to prevent closing of the switch with the door open
- b) 30 Only ultra-rapid fuses rigidly connected to the load side of the above mentioned mains isolator and the rating of which shall comply with the manufacturers specifications for the drive.
- c) 1 Only direct torque control frequency converter
- d) 1 Only door mounted control panel complete with cable connections (also for small drives)
- e) 1 Set of START and STOP push buttons for manual control of small drives
- f) One dial type potentiometer for manual speed control
- g) 1 Only manual/off/auto selector switch for manual control of small drives
- h) 1 Only thermister relay for motors of 22kW or more
- i) 1 Only external EMC line filter
- j) All equipment necessary for remote emergency stop device
- k) All bus system interface equipment necessary for remote speed control via a monitoring and control SCADA system as well as PLC control.
- l) All equipment necessary for remote motor status and speed monitoring.
- m) LED type red "Emergency stop engaged" indicator light.

A 3 CR12 steel gland plate must be provided at least 250 mm above floor level for cable connections.

The control panel shall be the user interface for monitoring, adjusting parameters and controlling the drive operation. It shall be possible to:

- a) Enter start-up data into the drive
- b) Control the drive with start, stop and reference signals
- c) Display actual values of motor performance
- d) Display information on at least the five most recent faults

The drive shall satisfy the following technical requirements.

- a) The static speed control error shall not exceed  $\pm 0,5\%$  of motor nominal speed
- b) Fundamental power factor shall be at least 0,97 at nominal load.
- c) Efficiency shall be at least 98% at nominal power level

- d) The drive shall operate satisfactorily under all ambient temperature conditions between -5 degree Celsius and 40 degrees Celsius at an altitude of 1260m above sea level and humidity up to saturation point.
- e) The drive shall provide output protection for motor overload, over current, short circuit at start, earth fault, missing motor phase and over frequency.
- f) The drive shall satisfy the following minimum harmonic voltage limits. Total harmonic distortion of 6%, odd harmonic distortion of 4% and even harmonic distortion of 2%. The Contractor shall measure these harmonic distortion parameters after commissioning of the system and if the equipment fails to comply with this requirement, the Contractor will have to rectify the same to the satisfaction of the Engineer.
- g) The drive shall be equipped with an AC choke for harmonic current reduction and shall be placed of the AC side of the rectifier bridge in order to protect the rectifier semiconductors against power line transients.
- h) Torques step rise time shall typically be less than 5ms
- i) Stringent precautions must be taken in the design of the protection equipment to assure adequate lightning and surge protection.

#### **Electronic Soft Starters**

The soft starter shall be installed in the relevant motor starter panel but sufficient ventilation by means of extractor fans must always be allowed for and shall be interlocked with the relevant motor and shall only be in operation when the motor is running. A bypass contractor for motor running conditions is a requirement and shall either form part of the soft starter or shall be a separate unit.

The soft starter shall have soft start and stop programmable capabilities with torque and current control. The normal motor protection facilities such as over/under-current, start limit, long start time, electronic overload, phase loss and phase sequence and load shall be available.

At least a 2 line 16 character LCD display unit with control function keys shall form part of the soft starter and shall preferably be separate motor starter front panel mountable. The LCD unit shall display all statistical data and trip conditions and shall allow functional key changes to programmable parameters.

The full motor protection capabilities shall be maintained when motor is operating in bypass contractor mode.

RS 485, MODBUS, PROFIBUS communication shall be possible.

#### **Induction Soft Starters**

The induction type soft starter shall be installed in the relevant motor starter panel but sufficient ventilation by means of extractor fans must always be allowed for and shall be interlocked with the relevant motor and shall only be in operation when the motor is running. A bypass contractor shall be provided to bypass the soft starter.

The series impedance type starter shall incorporate reduced starting current and ensure gradual increase in the motor terminal voltage in smooth step-less manner.

The design of the induction soft starter shall allow the motor to generate adequate starting torque to overcome the load torque and friction to ensure smooth acceleration.

The soft starter shall allow five starts per hour.

#### **Mains Surge Arrestors**

The surge arrestors shall be Type 2 and voltage compatible to the relevant installation and shall be able to withstand a lightning impulse current wave form 8/20µs at a maximum discharge current of 40kA.

Each distribution board shall be equipped with mains surge arrestors.

#### **Moulded Case Circuit Breakers**

All moulded case circuit breakers shall be as specified in the schedules of equipment for distribution boards and shall comply with the requirements of SANS Specification no. 156

The required frame sizes or rupturing capacities required are specified in the schedules for each board.

Each circuit breaker shall be provided with non-adjustable time delayed trips.

These circuit breakers shall be fitted with copper terminal collector bars where more than one cable tail has to be terminated on the same terminal.

#### **Fused Switches**

All fused switches shall be of the load breaking and fault making type complying with BS-5419 where applicable and fitted with HRC cartridges fused links to BSS-88. Auxiliary contacts shall be provided where relevant for signal purposes.

#### **Current limiting circuit breakers**

The current limiting circuit breakers shall be capable of remaining in service and of carrying their normal rated current after have interrupted the maximum short circuit current of 200kA rms at least three times.

The current limiting circuit breaker shall be equal and similar to the specified **Merlin Gerin type**.

#### **Current Transformers**

All current transformers shall be of the air insulated type complying in all respects with the requirements laid down in BS 3938: 1973.

The contractor shall carefully select the ratio, burden and accuracy class to suit its specific application in accordance with the recommendations and requirements of BS 3938.

#### **Indicating Instruments**

All indicating instruments shall comply with the requirements laid down in BS 89: Part I: 1970 for instruments of a 2.5 Accuracy Class. All indicating instruments shall have 96mm square dials.

The maximum demand ammeters shall be of the 6A combined maximum demand registering and instantaneous indicating type having MISC movement and thermal demand indication with an integrating time lag of 15 minutes. The ammeter scales shall be direct reading with a full-scale deflection corresponding to 120% of the rated primary current of

the relevant current transformer. Each ammeter shall be clearly and indelibly marked to indicate the colour of the phase to which it is connected.

The ammeters for motor starters shall be 5A instantaneous indicating meters with MISC movement and direct reading scales. The meters shall be able to withstand over currents resulting under starting conditions and the full load current of the relevant motor shall be clearly marked in red on the face of the meter.

Voltmeters shall be of the direct reading moving iron suppressed zero type.

The running hour meters shall have cyclometer dials indicating up to 5 digits and two decimals (123345, 67).

#### **Instrument selector switch**

A four-position rotary type instrument selector switch shall be mounted directly below the relevant instrument in such a way that only the selector knob and indicator plate are on the panel, and the switch itself is behind the panel.

The selector knob shall consist of Bakelite and shall have the positions for the three phases and "OFF" engraved on it in 5mm high lettering.

#### **Contactors**

All contactors shall be of the totally enclosed, three pole, double air break per pole, automatic magnetic type complying with the requirements of BS 775 for "CLASS UR" contactors of the CLASS 11 MECHANICAL DUTY CLASS" and A3 make and Break.

All contactors shall be provided with arc extinguishers, and readily replacements silver or silver-alloy contacts rated for at least 2-million "on and off" switching operations at rated current.

Each contactor shall be provided with an AC closing coil suitable for continuous operating and at least 15 closing operations per hour at system voltage. The contactor may not hum or chatter in service and the contacts may not bounce on closing.

#### **Time Switches**

The time switches shall be suitable for use on a 230V, 50 cycles per second AC supply and shall be of the microprocessor type.

The time switches shall be digital timers suitable for rail or surface mounting and shall be programmable with daily and weekly programs, switching intervals of 1 minute and switching accuracy precise to the second.

The time base shall be of the quartz type with LED display for time, weekday, holiday, program, switching position and manual override and shall have a power reserve of 250 hours at full operation. The time switches shall have a switching capacity of 16A at 230 V.

#### **Isolators**

All isolators shall be of the "Load-breaking" and fault making type and shall comply with the requirements of BS 5419-1977 where applicable. Where relevant, isolators shall be provided with auxiliary contacts for signal purposes.

#### **400 Volt air-break contactors**



All contactors shall be of the totally enclosed, three pole, double air break per pole, automatic magnetic type complying with the requirements of IEC 158-1 for Class AC 3 contactors of Intermittent Duty Class 0,3.

All contactors shall be provided with arc extinguisher and readily replaceable silver or silver-alloy contacts rated for at least 2 million "on " and off switching operations at rated current.

Each contactor shall be provided with a 250 Volt, 50 Hz closing coil suitable for continuous operation and at least 15 closing operations per hour. In rural areas contactor coils must be rated to operate satisfactorily between 75% and 130% of nominal voltage.

An adequate number of auxiliary contacts shall be fitted.

The contactor may not hum or chatter in service and the contacts may not bounce on closing.

#### **Earth Leakage Units**

The earth leakage units shall consists of a combination of an earth leakage relay and a moulded case circuit breaker and shall have sensitivity as specified; it shall conform to SANS 767.

#### **Terminals**

Terminals may be of the bolted type otherwise they shall be of rail mounted clamp type.

All types of terminals and their insulation shall have a minimum comparative creep index of 500 to BS 3781.

#### **Clamp type terminals**

These terminals shall be not less than 8 mm wide.

Screws and connectors shall be electroplated to prevent corrosion. The connectors shall be such that the screws will not loosen due to vibration. Current carrying parts shall be of serrated silver plated copper or brass. Only one connection shall be allowed by connector. For more connections the number of terminals shall be increased and bridge pieces shall be used.

#### **Surge Protection**

##### **Surge Arrestors**

Surge arrestors shall be supplied and installed under its contract where applicable.

##### **Main Supply Protection**

Surge arrestors as specified shall be installed at the main incomer of each distribution board, motor control centre or any type of kiosk.

#### **Power factor correction capacitors for 380 Volt motors**

Each of these capacitors shall be of the indoor switchboard mounting 400 Volt 50 cps three-phase self contained type with a dead casing and shall fully comply with the requirements laid down in BS 1650-1971.

Each capacitor unit shall be of carefully selected rating to correct the power factor of its associated motor to 0.95 at full load and should not exceed a value which compensates for 85% of the no-load magnetizing current.

The dielectric shall consist of plastic film and low-loss paper situated between aluminium foil and impregnated with a synthetic liquid agent with scavenger additive.

The capacitor losses shall not exceed 1 Watt/kVAr.

The capacitor units shall have the following admissible overloads at an ambient temperature of 40 degrees C and an altitude 260m above sea level.

- 10% excess volts continuously;
- 50% excess current continuously; and
- 30% excess kVAr continuously

Each of these capacitor units shall be provided with discharge resistors and a fuse in each winding element that will disconnect the affected element in event of a dielectric breakdown. A time controlled contactor shall connect and disconnect the capacitors to the starter control circuit.

#### **C3.4.2.7 MCC 07: DANGER SIGNS**

Danger signs on aluminium plates shall be supplied on each door of an outdoor motor control centre or distribution board and shall be in accordance with the Occupational Health and Safety Act, Act 85 of 1993.

#### **C3.4.2.8 MMC08: ELECTRONIC LEVEL CONTROL**

- a) The micro based electronic controllers which will be mounted in the starter panels shall be easy to calibrate and reliable in service.
- b) The power units for all the pumps in a specific pump station shall be installed in a separate compartment of the starter panel and clearly labelled in accordance with the pumps controls.
- c) These level controls shall be designed to automatically select the pump sequence to ensure that all the pumps will at random be a duty pump.
- d) Where a controller controls only two pumps and one pump is always a standby pump, the standby pump shall automatically become the next duty pump after each duty cycle, unless one pump is taken down for service. When that occurs, the duty pump shall remain on duty until the normal operation is restored.
- e) When a pump selected for duty fails to respond to the start signal from the control, and then the next duty pump shall automatically start-up after five minutes.
- f) The level controller must also stop all the pumps, whether on manual or automatic selection, when the pump has reached a predetermined low level.
- g) The transducers shall be designed to operate in air, been capsulated, of rugged construction and impervious to submergence. The transducer shall not form part of the MCC scope of supply.
- h) The coaxial cable between the transducer and power unit shall be of sufficient length to avoid any joints in this cable, as no joints will be permissible.

#### **C3.4.2.9 MCC 09: EMERGENCY STOP PUSH BUTTONS AND WEATHERPROOF ISOLATORS**

Each of these units shall consist of a totally enclosed outdoor type heavy duty "push and turn lock" stop push button station with a cable gland entry at the bottom to accommodate a 4 core 2.5mm LT PVC SWA PVC cable.

Where installed at motor positions the emergency stop push buttons shall not form part of the MCC scope of supply.

**C3.4.2.10 MCC 10: EARTHING**

The contractor shall do all the bonding and earthing in accordance with the latest addition of the "Code of Practise for the Wiring of Premises" SABS 10142.

The substation and HT switch room earthing shall consist of a 70mm<sup>2</sup> bare copper earth wire installed in the same trench as the HT supply cables. Earth resistivity measurements of less than 1 ohm will be acceptable.

**C3.4.2.11 MCC 11: INFORMATION TO BE SUBMITTED WITH THE TENDERS IN RESPECT OF THE 380 VOLT DISTRIBUTION BOARDS AND MOTOR CONTROL BOARDS**

The following information shall be submitted with each Tender in respect of all boards offered:

- a) Full technical details and descriptive literature regarding all equipment and instruments offered.
- b) Three paper prints of an outline drawing of each board indicating the main overall dimensions and general lay-out of the boards; and
- c) Three paper prints of an outline drawing of the front end processor cabinet indicating the main overall dimensions, general layout and type of material employed on the face of the panel.

**C3.4.2.12 MCC 12: INFORMATION TO BE SUBMITTED BY THE SUCCESSFUL TENDERER**

The successful Tenderer shall submit three prints of the under mentioned drawings to the Engineer for approval, before manufacturing.

- Outline and general layout drawings showing dimension and construction details.
- A wiring diagram
- A schematic single line diagram

After completion of the work, the contractor shall submit three final copies of each of the above-mentioned drawings showing the final layout and wiring diagram of the boards.

**C3.4.2.13 MCC 13: INSPECTIONS AND TESTS**

All equipment will be inspected by the Engineer and tested in his presence both in the factory during manufacturing and on site during installation. The Engineer will do all inspections accompanied by the Contractor and the Contractor will do all tests with the Engineer as witness.

The Engineer will require seven (7) days notification to avail himself for any test or inspection and the Contractor must arrange for the maximum number of inspections and tests to be done on the same day. The Contractor must provide all testing facilities and instruments, all equipment required for a test or inspection.

The instruments must have a valid test certificates issued by an acceptable testing authority and the results of the test done must be recorded on a test certificate, of which the Engineer must receive two copies. The Engineer reserves the right to call for a collaboration test on any instruments used during the test.

**The cost of all tests must be included in the tender price.**

**C3.4.2.14 MCC 14: TESTING OF DISTRIBUTION / MOTOR CONTROL BOARDS AT THE MANUFACTURER'S WORKS**

- a) Each distribution / motor control board shall be carried out to ensure compliance with the specification and approved drawings and wiring diagrams and to ascertain that all connections are properly made.
- b) A high voltage test on all primary connections to check the insulation between phases mutually and between each phase and earth.
- c) The polarities and ratios of all potential and current transformers shall be checked
- d) Primary and secondary injection tests shall be carried out on all switching, protection, metering interlocking and indication circuits.

The manufacturer shall submit three copies of test certificates giving details of conditions and results of tests carried out to the Engineer.

**C3.4.2.15 MCC 15: CONCRETE PLINTH FOR OUTDOOR STARTER PANELS AND PEDESTALS**

The plinth shall be cast 150mm below as well as 150mm above the ground level. It shall have neatly bevelled edges and shall be 75mm wider than the panels all round.

An opening of sufficient width to allow for cable entry shall be provided under the starter panels.

The grade 304 stainless steel foundation bolts for mounting of the panels shall be cast or grouted into the plinth. The plinth shall be in Class 20/19 concrete and shall be suitably reinforced if necessary.

It is recommended that the casting of these foundations must be carried out by the Civil Contractor at the cost of the Contractor under this Contract in accordance with his instructions and under his supervision.

**C3.4.2.16 MCC 16: INSTALLATION OF DISTRIBUTION BOARDS AND MOTOR CONTROL BOARDS**

Each of the relevant distribution boards and motor control boards shall be built on walls or securely bolted down on the floor or plinth, as may be required, by means of the requisite number of foundation bolts grouted into the floor in the positions indicated on the drawings.

These positions shall be confirmed with the Engineer on site, prior to installation.

**C3.4.2.17 MCC 17: TESTING AND COMMISSIONING OF DISTRIBUTION / MOTOR CONTROL BOARDS AFTER INSTALLATION ON SITE**

After installation on site but prior to commissioning the following inspections and tests shall be performed on each distribution / motor control board.

- a) Check all components to ensure that they are free from dust and protective packing material;
- b) Check the operation of all components liable to damage in transit such as meter and protection measured;
- c) The insulation of all primary circuits between phases mutually and between each phase and earth shall be measured;
- d) All fused links shall be checked for electrical continuity; and
- e) All control supplies shall be checked.

- f) All adjustable protection devices shall then be set and the boards commissioned all in consultation with and to the instruction of the Engineer.

#### **C3.4.2.18 MCC 18: OPERATING AND MAINTENANCE INSTRUCTIONS**

Before completion of the testing of the plant, the Contractor shall provide the Employer with adequate and complete working, operating and maintenance instructions in triplicate, with the necessary drawings and diagrams clarifying the instructions.

Instructions are to be made up in book form and particular reference is to be made to:

- a) Maintenance of equipment;
- b) Precautions to be taken in running the plant;
- c) All instruments and components must be fully described in data sheets supplied by the relevant suppliers;
- d) Wiring diagrams of the complete electrical installation.

The manual must be specific for the plant supplied and all extraneous material not connected with the relevant plant shall be deleted, leaving the manual as a comprehensive coherent document, bound in a professional way such that this may be used frequently without falling apart. Standard pamphlets may be supplied as addendums, bound separately in a good quality file to serve as reference but will not be allowed as part of the main manual.

#### **C3.4.2.19 MCC 19: MEASUREMENT AND PAYMENT**

Measurement and payment will be done in accordance with the methods stated below and reference should be made to the Bill of Quantities included elsewhere in the document.:

##### Design, Drawings and General

##### Pay Item

- Provide MCC design drawings and wiring diagrams as specified.
- Provide operating and maintenance manuals and "as built" drawings as specified.

##### Supply and Delivery to Site

##### Pay Item

- Supply and delivery to site of complete MCC.

##### Installation

##### Pay Item

- Site installation of MCC

##### Commissioning

##### Pay Item

- Commissioning of MCC

#### **C3.4.3 ELECTRICAL CABLES**

##### Cables and Accessories

##### General

The electrical contractor shall supply and install all cables and bare copper earth wires in the positions as indicated on the Drawings.

All cables and accessories shall comply with the relevant SABS and other applicable Specifications and shall be suitable for continued use in the conditions as specified previously.

#### Cables

The Electrical Contractor shall supply and install all cables and bare copper earth wires in the positions as indicated on the Drawings.

The supply cables shall be connected to circuit breakers in the existing LT Room or Distribution Boards, as described elsewhere and/or indicated on the Drawings.

#### Cable Markers

Suitable and approved cable route markers shall be installed along all cable routes.

These cable markers shall be installed at intervals of at least 100m along straight runs, at each change of direction in the cable route and immediately above each cable joint

### **C3.4.4 ELECTRICAL DISTRIBUTION SYSTEM**

#### Scope

Equipment shall be provided as specified and indicated on the drawings on the site of works.

#### Pressure Transmitters

A pressure transmitter with display unit 10mbar-40bar shall be installed in both the common delivery and suction pipeline of the pump sets.

Pressure transmitters shall be equal and similar to **Endress and Hauser** PMC41 as specified.

#### No-Flow Sensors

A no-flow sensor shall be installed in each of the pump set delivery pipelines all in accordance with the manufacturer's requirements. The weld stub supplied with the no-flow sensor shall be welded onto the delivery pipeline by the mechanical contractor. Tenderer shall make sufficient provision for the costs of welding the stub in the position.

No-flow sensors shall be equal and similar to Endress and Hauser Magphant DTI200 all as specified

#### Electronic Level Control

Electronic level monitoring equipment shall be provided at the following locations:

An electronic intelligent level transducer shall be supplied and installed on a grade 304 stainless steel bracket and inside a ventilated grade 304 stainless steel enclosure on top of the reservoirs (as specified below) at:

Clear Water Reservoir, on a 304 stainless steel bracket on the reservoir.

A ball type level sensor shall be installed complete with local surge protection and earthing system.

Emergency Stop Push Buttons and Weatherproof Isolators

Grade 304 stainless steel pedestal mounted emergency stop station shall be provided at all motor installation as specified.

Lightning Protection

The lightning protection at the pump stations forms part of this contract.

**C3.4.5 TELEMETRY SYSTEMS**

| <b>ITEM</b> | <b>DESCRIPTION</b>                |
|-------------|-----------------------------------|
| TMS 01      | SCOPE                             |
| TMS 02      | CONDITIONS TO SERVICE             |
| TMS 03      | STANDARDS AND TESTS               |
| TMS 04      | OUTSTATION CABINETS               |
| TMS 05      | RADIO                             |
| TMS 06      | GSM AND GPRS MODULES              |
| TMS 07      | SOLAR PANEL AND BATTERIES         |
| TMS 08      | SURGE PROTECTION                  |
| TMS 09      | EARTHING                          |
| TMS 10      | SOLENOID VALVES                   |
| TMS 11      | NUMBERING OF CONDUCTOR ENDS       |
| TMS 12      | CONNECTION OF CONDUCTOR ENDS      |
| TMS 13      | MONITORING SYSTEM                 |
| TMS 14      | TRANSDUCERS AND INTERFACES        |
| TMS 15      | CIRCUIT BOARDS AND COMPONENTS     |
| TMS 16      | FAULT FINDING AND TEST FACILITIES |
| TMS 17      | MODULAR DESIGN                    |
| TMS 18      | ANTENNAE                          |
| TMS 19      | OUTSTANDING HARDWARE              |
| TMS 20      | MEASUREMENT AND PAYMENT           |

**TMS TELEMETRY SYSTEM**

**C3.4.5.1 TMS1: SCOPE**

This specification includes the manufacturing, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability Period.

The applicable scope of the works covered by this section shall be defined in the Variations and Additions to the Standard and Particular Specifications Section C3.4.2 and relevant Tender drawings.

**C3.4.5.2 TMS 2: CONDITIONS TO SERVICE**

The electrical distribution system will be installed in an industrial plant environment.



**C3.4.5.3 TMS 3: STANDARDS AND TESTS**

All materials and equipment to be supplied and installed under this contract shall be new and of the best quality available.

All materials and equipment shall comply with the requirements laid down in the latest editions of the BS, SABS and IEC specifications and their amendments (if any) as well as those laid down in this specification. Where items bearing the SABS mark are available for any of those materials and equipment specified, only materials bearing the said mark, will be acceptable.

**C3.4.5.4 TMS 4: OUTSTATION CABINETS**

All equipment shall be housed in epoxy coated 2.0 mm thick 3 CR 12 steel dust and vermin proof cabinets. The cabinets shall have front access only. Cable entrance shall be possible from the bottom. The doors must be fitted with tamper proof locking catches with padlock facilities and shall be of the 3point type equal and similar to BARKER AND NELSON SERIES 25. Concealed chromed steel hinges shall be used on the front door.

All doors shall be fitted with intrusion detectors and all door handles shall be chromed.

Sufficient room shall be provided for rail mounted terminals strips, equal and similar to Kippon Type SAKR, which must be installed for all field equipment connections.

If the extremely high summer temperatures will present a problem to the electronic equipment, then the cubicle shall consist of an outer and inner shell with at least 10mm insulation or polystyrene between inner and outer shell all round to keep the temperature inside the compartment at least 5°C below the surrounding temperature. The doors of this compartment must also be of a similar double wall construction.

All ventilation openings shall be covered with copper gauze wire properly secured to inside surface of the cabinet, glued on gauze will not be acceptable. The cabinet shall be suitably sized to accommodate without cramping, all the equipment specified and shall be equipped with an unpainted 3 CR 12 steel cable end support at the bottom of the cabinet.

Outdoor cabinets shall be of the freestanding plinth mounted cubicle type with IP 55 insect proofed enclosure and shall be bolted down to a concrete plinth. Solar panel powered outdoor system cabinets shall consist of two separate compartments one for the telemetry system and the other to house the batteries. Reservoir roof mounted outdoor cubicles shall be frame mounted with frame secured to reservoir roof. Solar panels shall always be frame mounted and secured at the required angles for optimum solar energy utilization.

The plinth shall be cast 150mm below as well as 150mm above the ground level. It shall have neatly bevelled edges and shall be 75mm wider than the cubicle all around. The plinth shall be a class 20/19 concrete and shall be suitably reinforced if necessary.

Sufficient provision for breathing and heat dissipation must be made in this compartment. A danger sign manufactured from durable non-plastic corrosion resistant material must be installed on the access door of outdoor cubicles with a 230V supply of electricity.

**C3.4.5.5 TMS 5: RADIO**

The radio transceivers shall be of robust construction with digital signal processing communication technology for increased data throughput. No extra software or programming shall be needed to implement communications using standard asynchronous protocols. On an upgrade on an existing telemetry system similar radio communications system shall be incorporated.

**C3.4.5.6 TMS 6: GSM AND GPRS MODULES**

For low I/O count and lower power consumption GSM and GPRS modules shall be used for communication purposes. The Module shall be used for data communication via the available GSM cellular service provider networks.

The communication option available on the module shall be dial-up, SMS, GPRS and HSCSD. The module shall be provided with RS232 ports with MODBUS communication facilities. The cellular communication hardware module and sim card holder shall be on board mounted.

**C3.4.5.7 TMS 7: SOLAR PANEL AND BATTERIES**

When no electricity supply is available solar panels shall be used to charge batteries via a voltage regulator. A fully operational back up time of 96 hours (4 days) is required unless otherwise specified. At least two 85 Watt solar panels shall be installed at a radio communication solar panel installation or two 65watt solar power panels at GSM and GPRS installations.

The regulator shall be specifically designed for the telemetry use, where radio current draw varies from 0.1 to 5A for short durations of transmission. Allowance shall be made for at least 4 station interrogations per hour.

The regulator shall provide

- Over voltage cut-out of load if battery voltage is greater than 16 V.
  - Cyclic charge to keep battery voltage falls below 10V for more than 30 seconds.
- Low voltage cut-out of load if battery voltage falls below 10V for more than 60 seconds. Load is reinstated when battery is recharged to more than 12V DC.

Batteries less than 6.5Ah capacity shall not be used due to the high peak discharge current during radio transmission. Nickel Cadmium batteries shall not be used.

Sealed lead-acid batteries shall be used for capacities up to 65Ampere Hour, and vented lead-acid (Plant) storage cells designed for standby applications shall be used for larger capacities. Liquid based storage cells shall be housed in a separate vented lockable enclosure.

**C3.4.5.8 TMS 8: SURGE PROTECTION**

In addition to the surge protection already specified the following surge protection units shall be installed.

Main supply protection

The surge arrestors shall be Type 2 and voltage compatible to the relevant installation and shall be able to withstand a lightning impulse current wave form 8/20µs at a maximum discharge current of 40kA.

Each telemetry outstation shall be equipped with mains surge arrestors.

Solar power protection

The surge arrestors shall be a 24 V DC quick responding surge arrestor for use according to the lightning protection zones concept at boundaries 1-2 and higher and shall be able to withstand a lightning impulse current wave form 8/20µs at a normal discharge current of 1KA.

Antenna cables

The surge arrestors shall be suitable for multi frequency applications and shall have excellent RF endurance performance for use according to the lightning protection zones concept at boundaries 0A-1 and higher and shall be able to withstand a lightning impulse current wave form 8/20µs at a normal discharge current of 20kA.

**C3.4.5.9 TMS 9: EARTHING**

Outstations

Outstations in building and on manholes and valve chambers shall be connected to a 70 mm<sup>2</sup> bare copper ring earth installed 500mm below ground level around the circumference of the building or structure.

The ring earth shall be connected to the outstation by means of a 70mm<sup>2</sup> bare copper earths. At the four corners of the ring earth 2M long spurs consisting of 70mm<sup>2</sup> bare copper conductors shall be Cad welded to the ring earth and the bare copper conductor ends of the spurs shall be connected to 1.5m long earth spike driven into the ground at each end.

All earth connections at the outstations shall be connected to this ring earth.

**C3.4.5.10 TMS 10: SOLENOID VALVES**

Solenoid valves complete with hydraulic pipe couplings shall be provided where indicated for telemetry control of hydraulic controlled valves at reservoir sites. These units shall operate from a 24V DC supply and shall be of the low energy consumption type. The open/close status of the hydraulic valve shall be monitored where possible by means of a limit switch mounted on the hydraulic valve casing. A weatherproof cable termination box must be supplied and installed next to the control valve and provision must be made for connection cables between the termination box, solenoid and limit switch. The control valve will be controlled by means of the level sensor at relevant reservoir and must be a fail safe operation (valve must be close in the event of a power failure)

**C3.4.5.11 TMS 11: NUMBERING OF CONDUCTOR ENDS**

Every conductor end whatsoever, with exception of AC power cables at any terminal shall be numbered. The alphanumeric numbering shall be in accordance with – BS 158 – 1961.

These numbers shall correspond with those on the circuit diagram and shall consist of the slip on type numbering system (clipped on numbering system will not be accepted). It shall not be possible to remove the number holder damaging it or cutting off the lug.

**C3.4.5.12 TMS 12: CONNECTION OF CONDUCTOR ENDS**

All conductors whatsoever shall be connected at terminals by means of lugs and/or ferrules suitable for the specific conductor.

**C3.4.5.13 TMS 13: MONITORING SYSTEM**

System Organisations

The system will consist of the following organisation which may in future increase in size. The system shall be suitable to be modified to a decentralised type of control with intelligent outstations.

Monitoring

The system shall provide plant information to the following display devices:

- Mimic Display units

Analog readings shall be in close proximity to related devices on the display screens showing flow rates and shall be continuously updated after outstation scans.

The following indications are catered for:

- Indications of status of all motors and pumps;
- Indication of which relay or any other device caused changes in the system.
- Alarms are indicated visually and audible. When the alarm is accepted the audible indication is cancelled;
- Indication of internal faults in the supervisory system;
- When selected, indication of analog signals at specific points in the system as specified in the relevant clause; and ;
- When selected, indication of time, the control equipment and outstations shall give the indications

#### **Data and Event Recording**

The following information shall be recorded by the system:

- Automatic recording of events when a change of status takes place in the system and at the same time, recording time, date , outstation, item, alarm and identification.
- Automatic log all analogue values at present intervals from a particular outstation;
- Automatically log any number of selected analogs at preset intervals.
- Record keeping of the real time operation of all motors ; and
- Keep records of all controls transmitted.
- The data logging will be such that it can also be done by manual selection at any time.

#### **Measuring accuracies**

Measuring accuracies of 2.5% full-scale are required on all analog signals.

#### **C3.4.5.14 TMS 14: TRANSDUCERS AND INTERFACES**

Transducers shall be supplied and installed by the contractor and any other associated devices where it may be necessary in order that supervisory analog quantities can be measured by the telemetry. The monitoring and control system contractor will be responsible for all interfaces between his equipment and that of other contractors.

#### **C3.4.5.15 TMS 15: CIRCUIT BOARDS AND COMPONENTS**

Printed circuit boards shall be of epoxy glass fibre or seminar high quality fungus resistant, non-hygroscopic material.

All the through connecting holes shall be plated through.

Contacts on printed circuit boards and connector pins shall be gold plated.

#### **C3.4.5.16 TMS 16: FAULT FINDING AND TEST FACILITIES**

The equipment shall be designed in such a manner that staff of the employer with the minimum training in electronics, can do the maintenance on the equipment.

The contractor shall specify all the standard and special test equipment required for normal maintenance and testing purpose.

A rail mounted terminal strip equal or similar to Klippon Type SAKR shall be mounted in the supervisory panels for the connection between the plant equipment signals and electronic equipment.

**C3.4.5.17 TMS 17: MODULAR DESIGN**

The system shall be of modular design in order to facilitate expansion to the system by simple plug-in of additional modules and minimum wiring changes. All modules shall be DIN rail mounted and shall be interconnected by means of bus connectors.

**C3.4.5.18 TMS 18: ANTENNAE**

A list must be provided showing which mast is allowed for at each station. These shall be either:

- (a) Wall mounted: A 5mm tubular mast shall be fixed to the wall with a heavy-duty gauge galvanised offset bracket for 500mm roof overhang. The mast shall be either aluminium 50 mm diameters, 5mm thick, or steel galvanised 50mm diameter, 2mm thick.
- (b) Self-supporting 9m: A 9m flag pole type mast suitable for the size of antenna used, to withstand 140 km/h with loading shall be provided.
- (c) Self-supporting 12 to 18m: Mast above 12m should be lattice type construction. The mast plinth shall be supplied by the contractor. The contractor shall provide the concrete base with plinth and wire way. A sketch of the civil works must be provided by the contractor.

**C3.4.5.19 TMS 19: OUTSTATIONS HARDWARE**

Operational Requirements

- (a) General: The outstation shall comprise of a central processor unit with interface modules, a power supply, standby battery and plant input and output modules and commissioning system. All equipment shall be housed in a steel cabinet as specified. Apart from any other modules being necessary to operate and control the system satisfactory, the following modules shall be made available on the outstations.
  - (b) Power Supply: The stabilized power supply and battery charger unit shall be capable of re-charging a drained 15Ah sealed lead acid battery and shall operate from 230 V-AC. Battery backup for at least 24 hours of normal operation shall be provided for.
  - (c) The CPU module shall have a high speed RAM for executable program sections with a RAM size that will match the requirements of the application. Sufficient memory shall be equipped with a CPU watchdog timer circuit that will automatically restart the system in case of severe electrical disturbance. The CPU shall be auto-configuring and shall determine automatically which I/O modules are connected, do data addressing and mode of operation to run. Use of programmer at outstation shall not be necessary.
  - (d) Relay Interface Cards: Relay interface cards shall be available to connect control outputs to outside plant. LED monitors shall be fitted to this card to aid with fault-finding.
  - (e) Input/output modules: The digital I/O modules shall accept inputs from plant controls and auxiliary multiple operations and provide control outputs to plant operations. These modules shall also be capable to accept floating alarms of duration of 20ms as well as steady alarms from normally closed controls. All inputs and outputs shall be 2.5 kV isolated from logic components. Inputs and Outputs shall be protected against over voltage and over current. These I/O's shall be isolated from field equipment by means of interface relays in the outstation.
  - (f) Analog modules: These modules shall accept analog inputs from plant transducers and provide control analog outputs to plant operations and shall be capable of converting 0-5 V DC , 4-20 MA or 0-5 V AC signals by using external converters. All analog inputs and outputs shall be galvanic isolated.
  - (g) RS 232 Bus connectors: These modules shall accept data from an external source. The baud rate shall be adjustable from 300, 1200, 2400, 9600 or 19200-baud handshake protocol shall include XON/XOFF, CTS/RTS and direct.
- Outstation General: This outstation shall be capable of scanning all inputs and storing data in memory for collection by the mother station. It must also be possible to perform sequence control and interlocking of plant equipment.
- (h) Outstation Antenna: 10 dB Yagi antennas shall be installed at all outstations.
  - (i) Time Tagging: Events shall be time stamped at the outstations. Only a real time clock at the outstation will be acceptable which shall be hardware based with a crystal. Accuracy of time tagged events should be 20ms between events and 100ms between events at different outstations.
  - (j) Digipeating: The telemetry system shall have the facility to repeat commands destined from or to a remote station, via another station (Digipeating, or Store-and-forward). The digipeat "map" shall be stored in E2PROM (non-volatile memory) at relevant stations, and be able to be programmed with local programmer (e.g. LAP-TOP) or remotely via the communications medium. The digipeat map shall allow for input/output data to be transferred from any remote site to any other remote site and/or Central Station.
  - (k) Programmable Logic Controllers: Where logic control is required at an outstation for pump control programmable logic controllers shall be used. These PLCs shall be of reputable brand name, to allow after sales programming support by specialist vendors. The telemetry interface to PLC will be serial communications.

**C3.4.5.20 TMS20: MEASUREMENT AND PAYMENT**

Measurement and payment will be done in accordance with the methods stated below and reference must be made to the drawings and Bills of Quantities elsewhere in this document:

| <u>Pay Item</u>                                         | <u>Unit</u> |
|---------------------------------------------------------|-------------|
| <b><u>Supply and Delivery to Site</u></b>               |             |
| a) Supply and delivery to site of flow meters           | Sum         |
| b) Supply and delivery to site of level transducers     | Each        |
| c) <b><u>Supply and Delivery to Site</u></b>            |             |
| d) Installation of flow meters                          | Sum         |
| e) Installation of level transducers                    | Each        |
| f) <b><u>Commissioning</u></b>                          |             |
| g) Commissioning of flow meters                         | Sum         |
| h) Commissioning of flow meters                         | Sum         |
| i) Commissioning the telemetry link to the Control Room | Sum         |

**C3.4.6 PROGRAMMABLE LOGIC CONTROLLERS**

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**PROGRAMMABLE LOGIC CONTROLLERS**

**C3.4.6.1 PLC 1: SCOPE**

This specification includes the manufacturing, delivery, transport, handling protection, storage, installation, successful commissioning and upholding during the Defects Liability Period.

**C3.4.6.2 PLC 2: CONDITIONS TO SERVICE**

The programmable logic controllers will be installed inside motor control centres and programmable logic controller cabinets on the package plant and high lift pump.

|      |                                      |
|------|--------------------------------------|
| PLC  | Programmable logic controller        |
| SFC  | Sequential function chart            |
| SRS  | Software requirements specification  |
| CF   | Control function                     |
| CFS  | Control function section             |
| CSCI | Computer Software configuration item |
| CSC  | Computer Software Component          |
| CSU  | Computer Software Unit               |

**C3.4.6.3 PLC 3: STANDARDS AND TESTS**

The programmable logic controllers shall conform to and be in accordance with the latest applicable South African Bureau of Standards Codes and Standards as well as International Electrotechnical Commission Standards.



The following Standard Specifications and drawings shall apply:

SANS 10142 - Code of Practice for the wiring of premises

SANS 156 Moulded Case Circuit Breakers

SANS 1574 - Electric cables and flexible cords

NRS 002 - Graphical symbols for electrical power, telecommunication and electronic diagrams

SANS 1433-1- Terminal blocks having screws and screwless terminals

SANS 1433-2 Flat push on connectors

IEC 68 Shock and vibration resistance

IEC 1000 Electrostatic discharge and electromagnetic interference

IEC 1131 Standard Software

#### **C3.4.6.4 PLC 4: PROGRAMMABLE LOGIC CONTROLLER HARDWARE**

PLC 4.1 Hardware configuration

Normally the hardware configuration will be a single CPU with I/O modules as required mounted on a 19 inch rack backplane.

Remote I/O drops are permitted provided the remote I/O s are geographically close to the Programmable logical controllers (PLC)

PLC 4.2 General

The unit shall comprise of a programmable logical controller with interface modules, a power supply, plant input and output modules all suitable for 19 inch rack mounting. All equipment shall be housed in a steel cabined that will form part of that specific motor control centre unless the application requires a separate cabinet.

Apart from any other modules being necessary to operate and control the system satisfactory, the following modules shall be made available on the units.

PLC 4.3 Power Supply

The standalone single slot rack mounted power supplies shall operate from 230 V-AC and shall have sufficient capacity for the application. The power supply shall provide all regulated DC back plane power necessary for the installed modules. The power supply shall have over and under voltage protection for added security.

PLC 4.4 Processor

The CPU module shall be a back plane slot mounted controller containing on board executive memory, application memory and communication ports. It shall be possible to perform field upgrades through a field bus communication port. The front panel of the CPU shall be equipped with status and fault LED's to facilitate fault diagnostic procedures. The CPU shall have a multipoint interface for an external programming device as well as a field bus port.

For math-intensive application math-coprocessor hardware shall be included in the CPU.

Sufficient programming memory shall be made available to ensure at least 50% memory available after completion of application building for future expansion. The controller shall support at least of 32 I/O drops.

Ladder logic instruction performance shall be between 0,3 and 1,4ms per 1000. Clock speed shall be at least 20 MHz The CPU shall support at least the following IEC 1131-3 programming languages.

- a) Sequential Function Chart
- b) Function Block Diagram
- c) Ladder Diagram
- d) Structure Text
- e) Instruction List

The CPU shall be equipped with a lithium battery for battery backed RAM to hold application programs.

#### PLC 4.5

The communications processor shall provide communication links with other programmable controllers through process Field Bus or Ethernet systems.

The CPU shall have a real time clock for the generation of time related information.

#### PLC 4.6 Interface Modules

Interface modules shall connect I/O modules in multi-tier configurations.

LED monitors shall be fitted to this card to aid with fault finding.

#### PLC 4.7 Digital input/output modules

The digital I/O modules shall accept inputs from plant controls and auxiliary multiple operation and provide control outputs to plant operations. The modules shall be complete with I/O connectors. 24V DC input and output modules will be preferred.

These modules shall also be capable to accept floating alarms of duration of 20ms as well as steady alarms from normally closed controls. A typical response time of 11ms for change of state shall be acceptable.

All inputs and outputs shall be 2.5kV isolated from the logic components.

#### PLC 4.8 Analog modules

These modules shall accept analog inputs from plant transducers and provide control analog outputs to plant operations and shall be capable of converting 0-5V, 0-10VDC or 4-20 mA signals as may be required. All analog inputs and outputs shall be galvanic isolated.

The input module shall have a typical accuracy of at least  $\pm 0.05\%$  of full scale while the accuracy of the output modules shall not exceed  $\pm 0.2\%$  of full scale.

The input modules shall have broken wire fault detection capabilities.

#### PLC 4.9 RTD modules

These modules shall accept inputs from plant transducers. All inputs shall be galvanic isolated.

The temperature range shall be indicated in degrees Celsius and the modules shall accept RTD units of the American PT, IEC Platinum and Nickel N series.

The modules shall have out of range and broken wire fault detection capabilities.

Typical update time of 640ms for 2 or 4 wire systems and 1.2s for 3 wire systems will be acceptable.

#### **PLC 4.10 Ethernet network interface**

These modules shall accept data from an external source. The network speed shall be 10/100Mhz and higher. These modules shall be backplane mounted and shall receive and transmit field bus commands. Fibre optic connection through SP connectors shall be possible.

#### **PLC 4.11 Optical Link Modules**

The backplane mounted optical link modules for fibre optic cables shall allow networks to be configured in linear, ring and star structures and shall be supplied complete with the necessary cable connectors, interface cards and bus connectors.

#### **PLC 4.12 Switches**

The 10/100Mb Switch modules shall have a fibre optic Ethernet port and sufficient UTP connector ports with at least two spare ports for future use.

#### **PLC 4.13 Fibre optic splicing**

Fibre optic splicing shall be performed by a specialist contractor. The fibre optic connection between the splicing box and the fibre optic module shall be patch leads and not splicing leads.

#### **PLC 4.14 Fibre optic to UTP converters**

Where specified fibre optic to UTP converters shall be installed. These units shall be secured in an acceptable manner.

#### **PLC 4.15 Distributed I/O**

The distributed I/O module shall be a standalone unit with an integral 230V AC power supply and equipped with digital and analog I/O as may be required. The module shall have an Ethernet port.

#### **PLC 4.16 Uninterruptible Power Supply (UPS)**

ON-LINE transformer based (isolation transformer shall form part of UPS system) UPS system shall provide power to all PLC equipment with standby capacity of at least 2 hours.

RS232 interface shall be provided to relay UPS status (battery voltage, mains voltage, power failure alarm, battery low) to the SCADA system.

Bypass switch shall be provided to enable operating of PLC station in case of UPS failure.

Adequate lightning and surge protection units (on mains side) shall be installed.

### **C3.4.6.5 PLC 5:PLC GENERAL**

The PLC shall be capable of scanning all inputs and storing data in memory for collection by the SCADA system.

It must also be possible to perform sequence control and interlocking of plant equipment.

Outstations shall be modular PLC packaging system and shall consist of all necessary modules as may be required for the specific application. These PLCs shall be connected to the SCADA system via a Field bus of Ethernet system.

#### PLC 5.1 Input and output cards

The allocation of input and outputs shall be in logical manner. The allocation shall be on the basis of process units or streams or drives such that the failure of a card will cause minimum loss of plant availability.

Specifically for any motor starter the inputs shall be grouped on one card. The number of inputs allocated to a motor starter is such that they can be grouped on a 16 way input card so that at most two starters are allocated to one card. The allocation inputs and outputs of motor starters shall be such that a duty and standby motor starters are not together on the same I/O cards.

#### Rack Capacity

The final rack and input and output card installation shall have at least 10 percent spare slot capacity over and above any spare inputs or outputs on the installed cards.

#### PLC 5.2 Programmable logic software

All PLC software shall be structured in a logical manner representing the key process units and control regimes required for plant control/

#### PLC 5.3 Documentation

All PLC software shall be fully documented and the documentation shall consist of the following as a minimum:

- a) Functional specification of the plant to be controlled
- b) Process control logic diagrams
- c) Sample report forms
- d) Sample alarm report details (list and format reports)
- e) Fully annotated listing of the full software package
- f) Full input/output listings
- g) Full allocated register listing with functional description
- h) Program software in electronic format
- i) All documentation is subject to the approval of the Electrical Engineer.

#### PLC 5.4 Execution of control regimes

Control regimes shall generally be executed at PLC level unless the algorithms are too complex to execute at PLC level. Approval to execute control functions at supervisory level shall be obtained from the Engineer before commencement of the software.

### **C3.4.6.6 PLC 6 :COMMUNICATION**

#### PLC 6.1 General

PLC to PLC communication shall be field bus or Ethernet and if the communication link is required to go beyond a single room optical fibre modems shall be used. PLC CPU's located within a single building room shall communicate over conventional cabled networks using a suitable cable for the Communication link.

In some cases it may be possible to communicate directly with devices (such as variable speed controller, etc.) in which case master slave communication is permitted, peer to peer communication. If such facility for communication is available it is to be used in preference to hardwired 4-20mA and contact closed signals for process interfaces.

#### PLC 6.2 Interlocking control using communication networks

Where necessary to execute process control on a PLC and/or supervisory network the following shall apply:

Safety interlocks where human or equipment safety is a criterion may be communicated over a PLC to PLC network. The interlocks may not be communicated over a higher level supervisory network. This requirement does not negate the requirement to have hardwired safety stop controls on all drives and switchgear.

Non-essential interlocks, the failure of which will not cause harm to persons or equipment may be communicated with prior permission over a supervisory communication network. Preference, however, is to keep all interlocking at the field bus or Ethernet level unless rate of communication is compromised due to excessive traffic levels.

Data for the purpose of reporting and management information shall be channelled through the supervisory level network. Such data shall preferably not be transmitted on the field bus or Ethernet network level unless a supervisory level channel is not available.

#### PLC 6.3 Enclosures

PLC equipment shall be mounted in an IP54 enclosure with a suitable viewing window in front of the modules. The enclosure will form part of the motor control centre and in the event of no motor control centre available a separate enclosure will be acceptable.

#### PLC 6.4 Hardware Configuration Unit Basis

Hardware shall be configured on a unit basis which is each pump set shall be configured in a module with equipment dedicated to that pump set only on a unit by unit basis so that the failure of any one item will affect only a single pump set at any instant.

It will however be necessary to serve pump set PLC hardware with common services such as uninterruptible power supplies.

For this purpose the pump set shall be provided with the following:

- a) A control console located on the operating floor in a position where the operator is able to overlook the pump sets if specified.
- b) A Human Machine Interface terminal to display process and fault information if specified. The normal start and stop functions shall be executed by way of soft keys on the HMI terminals.
- c) An Emergency Stop push button for each pump set in the pump station mounted on the control console if so specified. The emergency stop push button shall have a red mushroom operator and shall be of the latching, twist to release type.
- d) Stop circuits shall be hardwired in the main circuit breaker control circuit as the primary trip route and shall also be wired into the PLC control circuit.

- e) Emergency trip push button shall activate both the trip coil and no volt release coil of the main circuit breaker or contractor where used.

#### PLC 6.5 HMI Terminal Process Information

The monitoring and control functions of each pump set shall be accessible on the human-machine interface.

The device shall be programmed that the control soft keys of each pump set are the same. To ensure that this requirement is maintained, a standard software package shall be applied to each pump set. Variable speed pump sets shall have the facility for speed adjustment added.

The HMI shall have a 10.4 inch colour screen (256 colours) and definition of 640 x 480 pixels. Sufficient application memory shall be available to ensure at least 50% spare memory after application building. The HMI shall be equipped with an Ethernet port for PLC communication.

The HMI shall be equipped with at least 8 dynamic keys with LED indicators 12 static keys with LED indicators and re-usable labels 12 service keys and 15 Alpha numeric keys.

The following basic process information shall be displayed for each pump set or pump stage as applicable.

- a) Operating Parameters
  - Suction pressure
  - Delivery pressure
  - Delivery flow rate
  - Running hours- accumulated total and since last start
  - Accumulated kWh
- b) Valve Parameters
  - Suction valves position indication
  - Delivery valve position indication
- c) Pump Parameters
  - DE and NDE bearing temperatures
  - Thrust bearing temperature
  - Vibration level
  - Volute temperature
- d) Motor Parameters
  - DE and NDE bearing temperatures
  - Phase stator temperatures
  - Motor Power
  - Motor current
  - Motor speed (variable speed drives only)
  - Power factor (variable speed drives)

- Vibration level
- e) Auxiliary Devices
  - Device run and stop indication
  - Device fault indication
  - Flood alarm
- f) The following basic information screen shall be provided
  - Process indication of the pump set
  - An Alarm Screen
  - Historic alarm screens (if required)
  - Protection settings with adjustment capabilities
  - Status indication of interlocks to facilitate evaluation of the start-up sequence
  - Status indication of the interlocks that are in Bypass condition
  - Main overview
  - Main 11kV electrical power supply system with status indication of all circuit breakers and associated equipment.

#### PLC 6.6 SCADA Interface

To facilitate an interface with a SCADA system the PLC shall have a field bus or Ethernet port as may be required.

The intention is that all main water pump sets be controlled from the relevant local control panel as well as from the SCADA system. However, process data will be collected via the field bus or Ethernet port for reporting and trending on the SCADA system.

Provision shall be made for control of the pump sets via the SCADA system by means of a selector switch on the motor starter panel located in the pump station which shall have the functions Automatic/Manual. Switching of this selector switch while a pump is running shall not trip the relevant motor.

Terminal strips in programmable logic controller panels.

Wiring directly to the PLC I/O cards is not permitted. All wiring shall be by way of two sets of terminals arranged such that one set of terminals are grouped on a cable by cable basis and the second set of terminals reflect the PLC I/O card slots. Patch Terminals used in PLC cubicles shall be of the knife type.

#### **C3.4.6.7 PLC 7 :PLC SOFTWARE DEVELOPMENT**

##### PLC 7.1 Software

IEC 1131 Standard software with up and down load capabilities programmable over the field bus or Ethernet network and compiles with a standard Graphical User. Interface 32 bit operating system for network applications shall be used.

The software shall allow the reusability of function blocks as building blocks in future applications and shall have a built-in PLC simulator that will allow the running of the IEC program for debugging purposes.

This specification describes the procedure for the development of PLC software. All PLC software developed shall conform to the conventions and standards described in this procedure. The documents described in this procedure shall be produced as outputs during the software development process and together they will enable the maintenance and use of software and they will simplify configuration management of software items/

#### PLC 7.3 Software Engineering requirements

PLC software shall be designed for continuous reliable operation

The software shall be designed for maintainability. This particular requirement enforces the following constraints on the software development:

It shall be possible to change the software in response to changing requirements by modifying only those sections of code that are directly related to the changed requirements.

The code shall be written on the premises that it shall be possible to make changes to local code sections without affecting the functionality of other code.

The programme style shall be direct and simple wherever possible. This will enable future modifications to be performed by programmers that may not have been involved in the development of the original system. Convoluting programming techniques tend to mask the essential design of the program. Such techniques shall only be used when the programmer has no alternative, or when the benefit (efficiency, size, execution time etc.) significantly outweighs the cost.

All PLC programs shall be extensively documented to convey the intended function of the program.

#### PLC 7.4 Computer Software configuration items

High level plant classes identified during the analysis phase shall be mapped to computer software configuration items (CSCI). Child classes shall be mapped to computer software components (CSC) and computer software units (CSU), in accordance with the class hierarchy of the system.

Each CSCI shall be comprehensively documented in a software requirements specification (SRS).

A CSCI, CSC and CSU shall be characterised by one or more control function instances. These instances may be grouped into one or more control function types. Control function types include interlocks, trips, control algorithms and other functional and logical entities that are required with and control of a specific piece of plant equipment.

#### PLC 7.5 Software requirements and specifications

Each CSCI be specified by means of a software requirements specification. The software requirements specifications shall meet the following requirements:

Each plant components that has been subjected to object-oriented analysis shall be described by a set of overview class hierarchy diagrams that illustrates the inheritance relationships inherent in the system. The class hierarchy diagrams shall illustrate inheritance in:

- a) The PLC input/output points
- b) Discrete and batch control functions, e.g. interlocks, trips, start-up sequence
- c) Continuous process control functions, e.g. PID control
- d) The analog and digital values that are generated by the PLC software and/or communicated to the SCADA system, e.g. metering information.



The requirements section shall contain an introductory subsection that describes the purpose of the software system, and in particular, the role of the PLC software in the system.

The requirements section shall specify the names and descriptions of all analog and digital plant inputs and outputs that are communicated to or from the PLC.

The requirements section shall incorporate several subsections called control function sections (CFS), each describing a number of instances of a specific control function. For example, a PLC program may implement several PID control loops. The software segment specification would then incorporate a PID Control Loops section in which each PID control loop is described in detail, in keeping with a standard layout.

The requirement section shall list and describe all digital or analog values that are generated by the PLC software (or that are scanned into the PLC) and then transmitted to the SCADA system.

The requirements sections shall include a detailed explanation of how the PLC driven systems operate in conjunction with the hard –wired systems.

## PLC 7.6 Generic Layout

Each CS shall conform to the following generic layout:

- a) Control function (CF) type and instance number- this number shall be unique for each instance in a control function class hierarchy

|                    |                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name               | A short text label that describes the control function                                                                                                                              |
| Description        | Textual explanation of the behaviour of the control function                                                                                                                        |
| Software algorithm | Explanation of the PLC logic that is used to implement the control function. The names of all the PLC inputs and outputs that are used shall be given in the algorithm description. |

- b) SCADA indication – the SCADA indication details of the control function are given, including the location of the indicator, the colour of the indicator, and the message details.
- c) Notes and associated conditions – any settings that may be relevant to the CF, or any conditions such as alarms or pre-conditions that relate to the CF shall be documented.

For example the requirements section may incorporate a subsection describing the interlocks that pertain to the particular class. Each interlock description shall incorporate the following:

|                    |                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interlock number-  | This number shall be unique for each interlock in a class hierarchy                                                                                                                                                                         |
| Name               | A short text label that is normally the same as the interlock message                                                                                                                                                                       |
| Description        | Textual explanation of the function of the interlock                                                                                                                                                                                        |
| Software algorithm | Explanation of the PLC logic that is used to implement the interlock. The names of all the PLC inputs and outputs that are used shall be given in the algorithm description.                                                                |
| SCADA indication   | The SCADA indication details of the interlock are given, including the location of the indicator, the colour of the indicator, and the message details                                                                                      |
| Pre-condition      | Any pre-conditions that must be satisfied before it can be confirmed that the interlock is unhealthy. In some cases it may be necessary to explain the algorithm and PLC logic of the pre-conditions and any overrides that may be present. |

## PLC 7.7 Naming and documentation of software

Each PLC program shall be documented in a manner that allows the reader to understand the functionality of the program and to locate the desired section of ladder logic.

A short program description document shall be produced for each PLC program. The primary functions of the program shall be listed in this document. For example the program might monitor and control electricity reticulation, provide water quality monitoring functions, and allow for the control of certain pump sets.

Each PLC program shall consist of several segments. Segments are used to divide the program in to logical sections. Segments are the basic schedulable entities within the PLC software. Each segment shall be documented by means of an SFC list. The SFC list gives some indication as to the purpose and structure of the program. Segment comments may be up to one page in length.

PLC segments consist of several SFC's. Each SFC shall be documented by means of a list of networks within the SFC. The list shall identify which of these networks are implemented as macros

and which are specific and unique to the SFC. This list is intended to give some indication as to the purpose and structure of the SFC. SFC comments may be up to one page in length.

Each SCF consists of a number of networks. The logic employed in each network shall be described in the network comments that may be up to one page in length. Where a network is implemented by a macro, the macro comments may be copied to the network comments screen or the network comments screen may simply reference the macro comments. Macro comments and network comments shall describe the PLC logic in terms of Power flow that is regulated by the opening and closing of coils.

Each coil and register that is used in the PLC program shall be described in the comments field that may be 50 characters long (10+10+10+20).

Print outs of appropriate ladder logic shall be attached to all network comment documents.

#### PLC 7.8 Macros

Macros shall be used wherever possible in the implementation of PLC software in order to promote software re-use.

Common software elements shall be identified from the plant class hierarchy.

A set of macros shall be associated with a specific plant class hierarchy, although a direct mapping of macros to entities in the hierarchy may not result in optimal re-usability. In such instances, the macros shall rather be designed for optimal re-usability.

The PLC logic used in macros shall be described in the macro comments screen.

The design of macros shall not be explicitly documented. The software segment specification relating to each software segment identified in the plant class hierarchy shall describe the functional and behavioural aspects of the PLC software. If the software has been implemented in terms of macros, then the reader shall know this from the network comments that are associated with the relevant software.

#### PLC 7.9 Operations manual

An Operations Manual shall be delivered with the software. This manual shall contain the following information:

- a) Details of all instruments and devices that shall be connected to the PLC
- b) Details of PLC – network connections
- c) A user document that describes how the PLC program shall operate in conjunction with SCADA systems, hard wired systems and mimic panels. This document shall inform the user of alternative control options and give some ideas of how the PLC system integrated with the plant and its hard wired systems.

#### PLC 7.10 Qualifications

##### PLC 7.10.1 Test Specification

A test plan shall be developed for each software segment whilst the software segment specification is being drawn up.

The test plan shall focus initially on verifying the architectural design of the program that is the partitioning into segments, SFC's and networks has been performed in an intuitive and logical manner.

Each trip, interlock and data output shall be tested by varying all pre-conditions and overrides. The test scenario for each case shall be comprehensively described. Details of how to model a particular override or pre-condition by modifying the hard wired configuration shall be given. Explicit criteria shall be given in terms of which the interlock or trip shall be deemed to have passed or failed the test.

#### **PLC 7.10.2 WALK-THOROUGH**

Structured walk-throughs and code inspections shall be carried out during the development of each software segment.

Walk-throughs shall initially focus on verifying the architectural design of the program that is the partitioning into segments, SFC's and networks has been performed in an intuitive and logical manner.

Ladder logic networks shall be tested individually. All possible coil status permutations shall be identified for each network. Factors that may cause coil statuses to change shall be identified and the ramifications of changing coil statuses shall be investigated. Where registers are used in the networks, factors affecting register values shall be identified, and tests shall be devised to investigate the behaviour of the software when register values changes to and from critical values.

A checklist shall be used to allow PLC programs to be checked for common PLC programming faults. The checklist shall be maintained on an on-going basis to ensure that the maximum number of common errors can be detected before testing and commissioning.

Walk through inspections shall be limited in duration to two hours or less.

Walk-through inspections shall be performed by a team of not less than three (and not more than four) people.

#### **PLC 7.10.3 TEST PROCEDURE**

Software testing shall be carried out on site.

Before testing begins, the plant to be used in the on-site tests shall be decommissioned and configured for testing.

Trips, interlocks and data outputs shall be tested individually. These tests shall follow the test specification that was produced in parallel with the software segment specification.

A test compliance document shall be completed during the test phase, and this document shall be included in the project documentation.

#### **PLC 7.10.4 CHANGE MANAGEMENT**

Changes to the functionality of a program may be required if the system fails due to an identifiable fault in the program, if the requirements change such that the change in specification forces a change in the software, or if sub-optimal system behaviour can be provided through software modification.

Faults reports shall be generated by the plant operators and they shall be passed on to the software configuration manager. Similarly, any change in requirements that leads to a change in specification shall be passed on to the software configuration manager.

Changes shall first be made to the software requirements specification. The ramifications of making the changes shall be investigated, and the software modules (segments, SFC, networks) that are affected shall be identified and modified.

Before the software changes are affected, a test plan shall be produced that describes how the changes are to be approved. This test plan shall be incorporated in the project documentation in the Change control section.

A walk – through inspection shall be held once the changes are complete. The primary goal of this inspection shall be to determine that all possible side effects that may be produced by the changes have been anticipated and explicitly dealt with.

Minutes from this inspection shall be appended to the body of the main project documentation in the Change control section.

The modified software shall then be tested according to the test procedure that was produced when the specification was amended.

#### **C3.4.7 UN-INTERRUPTED POWER SUPPLY**

##### **INDEX**

| <b>ITEM</b> | <b>DESCRIPTION</b>                        |
|-------------|-------------------------------------------|
| UPS 01      | UN-INTERRUPTED POWER SUPPLY               |
| UPS 02      | CONSTRUCTION OF CUBICLES AND SWITCHBOARDS |
| UPS 03      | INSTRUMENTATION AND CONTROLS              |
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| UPS 07      | INSTRUCTION OF OPERATOR AND MANUALS       |
| UPS 08      | TESTS                                     |

##### **C3.4.7.1 UPS01: UNINTERRUPTED POWER SUPPLY (UPS)**

###### **2.1 Definitions**

- (a) UPS shall denote the complete UPS unit with associated controls, remote alarm panel and batteries and any accessories required by the system for its successful operation.
- (b) Power Converter Module shall denote a rectifier, battery charger, inverter, electromechanical by pass switch and manually operated by pass switch.
- (c) Rectifier shall denote that portion of the converter module containing the equipment and controls to convert the incoming AC power to regulated DC power required by the inverter.
- (d) Inverter shall denote that part that converts the DC supplied by the rectifier to AC satisfying the load requirements.
- (e) Electro mechanical by pass static switch shall denote a bypass system provided break free switching from inverter to mains operation and vice versa.

- (f) Battery charger shall denote that portion of the power converter module containing the equipment and controls to convert the incoming AC power to precisely regulated DC power required for battery charging.
- (g) Critical load denotes the load as presented to the UPS by the computer or other load requiring constant supply and associated circuits and apparatus.
- (h) Mean Time Between Failure (MTBF) shall denote an overall MTBF of the UPS as a complete system.
- (i) A system failure shall denote any interruption to, or degradation of the critical load bus voltage or frequency beyond the limits set forth herein.
- (j) Efficiency shall denote the ratio of real output power (kW) to real input power (kW) with the UPS operating at a defined load power at the defined power factor, the battery fully charged and with nominal input voltage.

**2.2 System Requirements (The Required Input and Output Voltages Are Detailed In Part 2 Of This Specification)**

**(A) Input to the UPS**

- (a) Input voltage : 400/231V  $\pm$  10% or 231V  $\pm$  5%
- (b) Frequency : 50Hz  $\pm$  4%
- (c) System : 1 phase 2 wire or 3 phase 4 wire with operative earth conductor, supplied from utility network or standby generator set. Refer to detail specification.
- (d) Power factor : Not less than 0,8 lagging.
- (e) Max starting current : 10 times full load current for not more than ½ a cycle with rectifier soft starting facility.

**(B) Output to Load**

- (a) Rating : Refer to detail specification.
- (b) Output voltage : Refer to detail specification.
- (c) Frequency : 50 Hz  $\pm$  0,5 Hz.
- (d) System : 1 phase 2 wire or 3 phase 4 wire with operative earth conductor.  
Refer to detail specification.
- (e) Voltage regulator :  $\pm$  10% maximum deviation of steady state voltage recovering to within 5% in less than 50 ms and to within 1% less in that 100 ms.
- (f) Frequency stability : Normally automatically synchronised to mains frequency if the latter is within 50 Hz  $\pm$  2% (adjustable window) Runs free at 50 Hz  $\pm$  0,5 Hz at any load when mains is out of limits.
- (g) Harmonic content : Less than 4% total distortion.
- (h) Amplitude modulation : Less than 2%

**(C) Overall Performance**

Efficiency (overall) : 80 85%

(D) Ambient Operating Conditions

Refer to Section 1, General – Clause 5

(E) System Description

The system shall consist of a static UPS complete with the following components :

- (a) Rectifier/charger.
- (b) Inverter.
- (c) Battery.
- (d) Automatic electronic no break bypass circuit and switch.
- (e) Separate manual bypass switch.
- (f) Protective devices and measuring equipment.
- (g) The required controls and necessary equipment.
- (h) A self-monitoring system with digital readout by means of which all critical functions can be checked.

Note: Requirement (h) Is Only For Ups Systems Above 200 kVA

The system shall be capable of providing an uninterrupted supply to the load with the output characteristics as specified for a minimum period of 30 minutes during a total mains failure (i.e. normal mains and standby generator supply failure). The batteries shall be rated at an AC load power factor of 0,8 lagging.

The complete system, including all controls shall be designed in such a way that the failure of any one vital central component will NOT cause a complete system failure. If necessary such a failure must be avoided by connecting the load directly to the mains by means of the bypass switch.

The UPS shall operate satisfactorily synchronous with the mains supply even under severe conditions of up to 100% unbalanced load.

The UPS shall be amply rated to carry the stated full load current. The UPS shall furthermore be capable of withstanding the following overloads.

Static Overloads: 100% of full load continuously.

125% of full load for 5 minutes.

150% of full load for 2 minutes.

165% of full load for 1 second with inductive decay after initial equipment switch on surge current.

Dynamic Overload : 300% for less than 5 msec.

1000% for less than 1 msec.

All component parts, cables and other connections shall be amply rated to withstand the overloads stated and maintain the input voltage at the load within the tolerances stated.

The equipment shall be designed for the maximum operating efficiency. The efficiency shall be determined when the system is delivering full load at 0,8 power factor with the batteries fully charged. The load required by the auxiliary equipment (controls, alarms, etc.). Electronic switches and cabinet fan shall be included in the determination of overall efficiency. A typical test report clearly showing how the efficiencies are calculated, shall be submitted with the tender.

It shall be the responsibility of the successful tenderer to ensure satisfactory operation of the complete system for the load to be supplied. It is, therefore, essential that the tenderer acquaints himself fully with typical load conditions before the tender closing date.

All cabinets containing thyristors shall be adequately screened and earthed to prevent direct radio frequency radiation.

Tenderers shall submit with their tenders a schematic diagram showing :

Input circuit breakers.

System busbars.

Rectifiers.

Batteries.

Inverters.

Electronic switches.

Bypass circuit.

Detour circuit.

Fuse protection.

Output circuit breakers.

Oscillator.

Power supply circuits to oscillator, alarms, controls, etc.

Battery isolator.

The diagram shall also show the relative phase displacement of the rectifier transformers.

NOTE: This Is Not Applicable To Systems Below 200kVA.

**(F) Inverter Oscillator**

The inverter shall contain an oscillator capable of operating and maintaining the inverter output frequency as specified. The inverter oscillator shall be capable of frequency synchronisation and phase locking to the mains (or standby generator) power source frequency. When operating as a slave to the mains or standby power and a failure occurs in the slaving signal, the inverter oscillator shall automatically revert to a free running state and maintain the specified limits. All changes in output frequency to free run or synchronise shall be gradual to suit the load requirements.

**(G) Rectifier**

The UPS shall have its own rectifier and rectifier transformer which shall operate satisfactorily from the mains or standby supply.



The rectifier shall be of the solid state type providing full wave rectification of the input voltage suitably regulated to suit the input requirements of the inverter. Where necessary, a high grade DC filter shall be utilised to limit the output ripple to within acceptable levels for the inverter input. Current limiting features shall be provided to protect the rectifier. The current limiting settings shall be variable for final adjustment on site.

Voltage free contacts shall be provided for the malfunction alarms of the rectifier.

An input monitoring circuit shall be provided for the rectifier. This circuit shall switch off the rectifier when the r.m.s. value or frequency of the input voltage falls below present values.

The necessary protection circuitry shall be provided to switch off the rectifier if any one of the rectifier phases should fail, thus presenting an unbalanced load to the incoming supply.

The output of the rectifier shall be connected in parallel to the battery and inverter.

The rectifier shall have over temperature protection. Temperature sensing probes shall be placed on the thyristor housing, thyristor mounting, or on the heat sink close to the thyristor. The sensing of the off coming air temperature alone is not acceptable.

Tenderers shall take into account the possible effects of harmonics that may be present on the input supply due to non-sinusoidal waveforms at the rectifier input, phase commutation, the effect of reactance during phase commutation etc. The input voltage monitoring circuits of the rectifiers shall be adequately filtered and buffered to ensure reliable load control and to prevent continuous on off switching of the rectifiers.

For three phase units each of the three rectifier transformers shall have a different primary to secondary phase displacement in order to minimise the harmonics generated by the rectifiers.

NOTE: This Is Not Applicable For Systems Below 200 kVA

#### (H) Inverter

The inverter shall be adequately protected against any excessive overload or short circuits that occur in the load. Reactive current limiting or other methods shall be employed to render the thyristors short circuit proof. The successful tenderer shall replace any thyristors or any inverter components at his own expense if these should be damaged.

The necessary feedback and control circuits shall be incorporated to ensure satisfactory operation separately or in synchronisation with the mains supply under all conditions of dynamic load variations, stated overloads, severe unbalanced conditions and high operating temperatures. The thyristor bridge shall contain the necessary auxiliary circuitry to ensure satisfactory operation.

The output of the inverter shall be connected in parallel with the thyristor switch output.

Each inverter shall have over temperature protection similar to the over temperature protection for the rectifier.

A discharge device shall be provided across the D.C. input to the inverter, which will discharge any capacitors in the inverter module when it is switched off.

#### (I) Battery charger

The battery charger shall be a solid state, constant voltage type providing full wave rectification of the input voltage with the output regulated to an accuracy as specified. A high grade D.C. filter shall be utilised to limit the output ripple to the stated tolerance. Current limiting features shall be provided.

The value of the current limit setting, shall be in accordance with the maximum allowable charging current that the batteries can withstand.

The maintained voltage on float charge shall be such as to give maximum life to the batteries whilst maintaining the maximum charge conservation and minimising gas formation and water loss. The optimum float charge voltage shall be specified by the battery manufacturer but is expected to be approximately 2,23 volts per cell. The voltage shall be kept within  $\pm 0,5\%$  of the nominal value for all loads from no load to the full rated battery charger current when supplying the full output with batteries discharged.

**(J) Computer rooms/office UPS installation**

The rectifier shall be equipped with 2 independent over voltage shutdown contacts for maximum charger security.

The battery charger shall be designed to charge the batteries to 90% of its fully charged capacity within 14 hours and to 100% capacity within 20 hours.

The battery charger shall be capable of boost charging the batteries to 2,6 volt per cell. The boost facility shall be manually operated.

The battery charger shall be provided with a current limiting circuit.

The current limit setting shall be variable for easy adjustment on site.

The necessary voltage free contacts for the alarms and battery charger failures shall be allowed for in the tender price.

The battery charger shall have over temperature protection similar to the protection specified for the rectifier.

The battery charger shall have circuitry to inhibit the charging of batteries from the standby generator. This circuitry shall be activated by normally open contacts on the generator control panel. The interconnecting cables will be supplied and installed as part of this contract.

NOTE: This requirement is only applicable for UPS systems above 200kVA

**(K) Battery**

The battery capacity shall be sufficient to provide full load for the specified time. The capacity shall be rated at a maximum specific gravity of 1,245 at 25 C and correctly filled.

Tenderers shall state the discharge capacity of the battery after 10 hours of charge and the battery voltage at its terminals under various conditions. The inverter shall switch off on low battery voltage.

The battery cells shall be of the maintenance free type.

The batteries shall give satisfactory service for a minimum period of 3 years. Tenderers shall state the maximum expected lifetime of the batteries and motivate their statement, and provide a statement by the battery manufacturer supporting this and stating that the charger offered is suitable for the battery.

The cells must be mounted in a matching steel cabinet or in the same cabinet as the control equipment. The vented type cells should be mounted on a wooden stand, consecutively, numbered with positive and negative terminals clearly marked in a ventilated battery room.

The batteries shall be complete with cell inter-connectors and row inter connectors. The output terminals shall be robust and adequately dimensioned for the output cable terminations.

The inter connectors between cells and shall be made in a manner giving the lowest volt drop and maximum resistance to corrosion.

All connections to cells must consist of flexible cable to avoid mechanical stress at the cell terminals.

The tenderer shall describe the method of removal and replacement of a faulty cell.

The battery shall be complete with a battery fuse isolator capable of breaking the full load current drawn by the inverter. These battery fuse isolators shall be installed in the inverter unit room or cabinet.

Terminal posts should be effective for the expected lifetime of the battery and should be effective even if the cell is overfilled.

The battery may be resistance grounded through 5000 ohm to 10000 ohm for the purpose of ground fault.

Tenderers shall submit full details with dimensioned drawings of the batteries offered.

Tenderers shall submit the calculations and motivations complete with curves supporting the selection of a specific battery cell.

All cabling for the battery shall be installed on PVC cable trays and fitted to the satisfaction of the engineer.

(L) Automatic by pass switch

An integral automatic bypass switch shall be provided to transfer the critical load without break to the mains should the UPS unit fail. The latter unit shall simultaneously be disconnected from the critical load bus. This transfer shall, however, be inhibited if the mains is out of synchronism with the UPS output. Retransfer to the UPS output shall be on a manual or automatic command. This switch must have a cover fitted screwed to the panel so as to make the operating of this switch impossible without having first removed the cover. This switch cover must also have the following words etched in white with a red background mounted on or adjacent the cover: CAUTION : BYPASS SWITCH ONLY : ONLY TO BE OPERATED BY QUALIFIED PERSONNEL

The static switch should prevent "hunting" and after trying unsuccessfully to switch a maximum of three times the static switch should be inhibited from further switching.

#### **C3.4.7.2 UPS 02: CONSTRUCTION OF CUBICLES AND SWITCHBOARDS**

All the converter equipment shall be housed in totally enclosed, free standing, floor mounted cubicles, designed to provide adequate ventilation for the equipment.

All cubicles shall be rigid with suitably braced doors providing front access.

All cubicles shall be vermin proof.

All equipment shall be mounted on the metal framework suitably arranged to provide safe operation and ease of access. Fuses and switchgear in particular should be safely accessible even under load conditions.

All power bridges, filters and other major components both in the inverter and rectifier, shall be completely withdrawable to facilitate rapid repair and/or replacement. The method of withdrawal shall be such that a complete module can be extracted in the operating condition so that checks and measurements may be made while in operation and access to all components facilitated.

All electronic printed circuit cards shall be of a good quality and shall be easy and simple to interchange.

All auxiliary power supplies shall be duplicated and shall be connected so as to operate in parallel redundancy. At least two primary sources of power shall be provided for each of the power supplies in the system.

Flexible wires shall not be soldered directly onto terminals but shall have a crimped tab, which is soldered onto a terminal or post. The wire wrapping technique shall be employed for electronic circuits where possible.

The front panel alarms shall be clearly and adequately marked in both official languages. A single line mimic layout of the switchgear shall be provided on the front of the cubicles providing a graphic display of the circuitry of the equipment involved.

All input and output power cables shall be terminated using approved cable glands, onto a cable gland support bracket. The cable conductors shall terminate at the connecting busbars or shall be connected directly to the appropriate switchgear. All power cables shall be properly numbered with wrap around cable markers with punched figures to identify cables at each termination point.

#### **C3.4.7.3 UPS 03: INSTRUMENTATION AND CONTROLS**

All the required instrumentation as indicated on the drawings shall be provided.

Supply and install all the necessary controls for the operation of the system. Facilities shall be provided for controlling the rectifier, switching the inverter on, switching the inverter output to the synchronous motor/alternator and controlling the bypass thyristor switch circuit.

All control switching of the rectifier and inverter as well as the bypass operation shall be pushbutton initiated.

Standard electronic equipment from overseas manufactures shall not be accepted if not duly protected with transsorb and metal oxide varistors in power supplies and external communication lines. Standard electronic equipment not internally protected with transsorb or MOV's may be protected externally by means of transsorb and MOV's mounted on klippon type terminals. All external communication and remote power supply lines shall be protected by means of transsorb and MOV's of sufficient rating mounted on klippon type terminals.

#### **C3.4.7.4 UPS 04: ALARMS**

All alarms shall be of the tell-tale type with memory features e.g. a flashing light indicates a fault coupled with an audible alarm. The pressing of the appropriate button shall cancel the audible alarm and allow the alarm lamp to burn continuously until the fault is removed.

The following minimum alarm conditions shall be monitored on the equipment:

- (1) Normal
- (2) Mains failure
- (3) Inverter failure
- (4) Shutdown imminent
- (5) Load on mains
- (6) Overload

**(7) Charger fails**

Where required a remote panel must be supplied and installed. The alarms indicated must duplicate all the alarms indicated on the UPS control panel. In addition a buzzer must be provided. Any alarm occurring must sound the buzzer to draw attention. An alarm accept pushbutton to silence the buzzer must be provided.

Provision shall be made on all the alarms mentioned above to be remotely monitored. Normally open contacts shall be supplied at the converter for each alarm for this purpose. The contacts shall close under an alarm condition.

**C3.4.7.5 UPS 05: VENTILATION**

All equipment racks shall be positioned in logical fashion on the floor in a configuration, which will ensure proper ventilation

Each cubicle containing heat-generating equipment (thyristors, transformers electronic circuitry, filters, etc.) shall, where necessary, have extraction ventilation fans mounted on the top of the cubicle to assist air circulation. These fans shall be fed from the output distribution panel of the uninterrupted power supply.

**C3.4.7.6 UPS 06: QUALITY ASSURANCE**

The manufacturer shall be responsible for the performance as specified herein and to prove such performances to the satisfaction of the engineer. Except as otherwise specified, the supplier must utilise facilities acceptable to the engineer.

**C3.4.7.7 UPS 07: INSTRUCTION OF OPERATOR AND MANUALS**

After completion of the installation, and when the plant is in running order, the successful tenderer will be required to instruct an attendant in the operation of the plant, until he is fully conversant with the equipment and handling thereof.

Three (3) copies of maintenance, fault localising and operating manuals together with the drawings required shall be handed over to the engineer.

**C3.4.7.8 UPS 08: TESTS**

The complete testing including the provision of test facilities, instruments, dummy loads and switchgear at the manufacturer's premises in the Republic of South Africa shall form part of this contract. If the factory tests cannot be performed in the RSA, the client may, at his discretion and own cost, decide to attend tests at the supplier's overseas factory. Tenderers shall not allow for this.

For the test in the manufacture's premises the client shall be notified four weeks in advance in order that a representative can be sent to witness these tests.

**C3.4.8 SCHEDULE OF MATERIALS AND EQUIPMENT OFFERED**

It is **compulsory** for the Bidder to complete the table below, and failure to do so may lead to disqualification. Furthermore, degree of compliance with specifications will count in scoring of tenders received.

**C3.4.8.1 MCC**

| NO. | ITEM                                                            | BIDDER'S DESCRIPTION |
|-----|-----------------------------------------------------------------|----------------------|
| 1   | <b>MCC Motor Protection System</b>                              |                      |
|     | Manufacturer                                                    |                      |
|     | Make                                                            |                      |
|     | Model Number                                                    |                      |
|     | Is the MCC protection system as per section 0 of this document? |                      |
| 2   | <b>MCC and Distribution Boards</b>                              |                      |
|     | Manufacturer                                                    |                      |
|     | Supplier                                                        |                      |
|     | Installation contractor                                         |                      |
|     | Manufacture of LT circuit breakers                              |                      |
|     | Manufacturer of contactors                                      |                      |
|     | Manufacturer of meters                                          |                      |
|     | Manufacturer of current transformers                            |                      |
|     | Manufacturer of motor protection relays                         |                      |

**C3.4.8.2 SENSORS**

|   |                                 |  |
|---|---------------------------------|--|
| 1 | <b>Ultrasonic level sensor</b>  |  |
|   | Manufacturer                    |  |
|   | Supplier                        |  |
|   | Installation contractor         |  |
| 2 | <b>Hydrostatic level sensor</b> |  |

|                 |                                                 |       |
|-----------------|-------------------------------------------------|-------|
|                 | Manufacturer                                    | _____ |
|                 | Supplier                                        | _____ |
|                 | Installation contractor                         | _____ |
|                 |                                                 | _____ |
| <b>3</b>        | <b>Pressure sensors</b>                         | _____ |
|                 | Manufacturer                                    | _____ |
|                 | Supplier                                        | _____ |
|                 | Installation contractor                         | _____ |
|                 |                                                 | _____ |
| <b>4</b>        | <b>No-flow sensors</b>                          | _____ |
|                 | Manufacturer                                    | _____ |
|                 | Supplier                                        | _____ |
|                 | Installation contractor                         | _____ |
|                 |                                                 | _____ |
|                 |                                                 | _____ |
| <b>C3.4.8.3</b> | <b>LOW VOLTAGE CABLES AND TELEMETRY SYSTEMS</b> |       |
| <b>1</b>        | <b>Low voltage cables</b>                       | _____ |
|                 | Manufacturer                                    | _____ |
|                 | Supplier                                        | _____ |
|                 | Installation contractor                         | _____ |
|                 |                                                 | _____ |
| <b>2</b>        | <b>Telemetry System</b>                         | _____ |
|                 | Manufacturer                                    | _____ |
|                 | Supplier                                        | _____ |
|                 | Installation contractor                         | _____ |
|                 |                                                 | _____ |
|                 |                                                 | _____ |
| <b>3</b>        | <b>Coaxial cable</b>                            | _____ |
|                 | Manufacturer                                    | _____ |
|                 | Supplier                                        | _____ |
|                 |                                                 | _____ |

|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                 | Installation contractor                                                                                                                                                                                                                                                                                                                                                             |  |
|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
| <b>C3.4.8.4</b> | <b>programmable logic controller (plc)</b>                                                                                                                                                                                                                                                                                                                                          |  |
| <b>1</b>        | <b>PLC Board</b>                                                                                                                                                                                                                                                                                                                                                                    |  |
|                 | Manufacturer                                                                                                                                                                                                                                                                                                                                                                        |  |
|                 | Supplier                                                                                                                                                                                                                                                                                                                                                                            |  |
|                 | Installation contractor                                                                                                                                                                                                                                                                                                                                                             |  |
|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
| <b>C3.4.8.5</b> | <b>UN-INTERRUPTED POWER SUPPLY</b>                                                                                                                                                                                                                                                                                                                                                  |  |
| <b>1</b>        | Manufacturer                                                                                                                                                                                                                                                                                                                                                                        |  |
|                 | Supplier                                                                                                                                                                                                                                                                                                                                                                            |  |
|                 | Installation contractor                                                                                                                                                                                                                                                                                                                                                             |  |
|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
| <b>2</b>        | Battery                                                                                                                                                                                                                                                                                                                                                                             |  |
|                 | Manufacturer                                                                                                                                                                                                                                                                                                                                                                        |  |
|                 | Supplier                                                                                                                                                                                                                                                                                                                                                                            |  |
|                 | Installation contractor                                                                                                                                                                                                                                                                                                                                                             |  |
|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
|                 |                                                                                                                                                                                                                                                                                                                                                                                     |  |
| <b>C3.4.9</b>   | <b>TESTING OF EQUIPMENT</b>                                                                                                                                                                                                                                                                                                                                                         |  |
|                 | <p>The Contractor shall execute and submit to the Engineer all test results in accordance with clause 29 of the General Conditions of Contract in order to prove that the equipment supplied under the Contract conforms in all respects to the Specifications. In particular, successful execution of the following testing is required in respect of completion of the Works:</p> |  |
| <b>C3.4.10</b>  | <b>FACTORY ACCEPTANCE TESTING</b>                                                                                                                                                                                                                                                                                                                                                   |  |
|                 | <p>Any imported material and equipment needs to be inspected, checked and tested before shipment. The contractor shall submit a list of all factory acceptance tests to be performed for all critical equipment supplied under the contract.</p>                                                                                                                                    |  |
|                 | <p>The Contractor shall prior to shipment, submit to the Engineer all test results on Plant and Material that are to be manufactured or shipped from foreign destination. No material shall on any account be shipped before receiving the Engineer's approval in writing.</p>                                                                                                      |  |
| <b>C3.4.11</b>  | <b>DRY COMMISSIONING</b>                                                                                                                                                                                                                                                                                                                                                            |  |
|                 | <p>Once the construction of the Works or a Sub-section has reached the stage of completion where it can be tested, the Contractor shall give to the Employer notice of the date after which the Contractor will be ready to carry out Dry Commissioning of the Works or any</p>                                                                                                     |  |



Sub-section thereof. Dry Commissioning shall commence as soon as the Works or a Sub-section is mechanically and electrically ready to test, it shall undergo commissioning tests and inspections to check the following general aspects:

- a) Components of the Works or Sub-section are complete and comply with drawings, specifications and data as indicated in the manufacture's documentation.
- b) The assembly has been carried out in compliance with the above documents and professional practice
- c) Visual checking installation and appearance

**In addition dry commissioning shall include the following specific aspects:**

- a) Through check of all ergonomic (Lighting and noise), maintainability and safety related aspects.
- b) Through check of flow lines of products , materials, fluids and compressed air
- c) Through check of electrical, hydraulic, pneumatic and electromechanical circuits.
- d) Through check of all functional and control loop tests (Equipment level).
- e) Dry-run of every machine and checking of its operation and, if necessary, running in.
- f) Calibration checks and supporting documentation on all metering and monitoring equipment.
- g) Dry-run or no-load run of every section.
- h) Fixing of equipment, cable racks, pipes, brackets, anchors, etc.
- i) Written proof of all direction testing and alignment tests on pumps, motors and rotating equipment.
- j) Statutory testing requirements (Lifting, hoisting, pressure vessels etc.)
- k) Checking and testing of all actuators, valve and control valve settings.
- l) Water testing of chemical dosing equipment, pipes, and joints.
- m) Water tightness and pressure tests on all water retaining structures, pressure vessels, pipelines and pipe fittings.
- n) Completion and assuring of all tests reports and test certificates
- o) Completion of cathodic and lighting protection.
- p) Compiling of an asset register suitable for interrogation with the financial and Computerised Maintenance Management system of the client.
- q) Completion and issuing of all equipment and O&M manuals including functional specifications and control philosophy.
- r) Supply of all critical spares and special tools on site

Following the successful completion of Dry Commissioning the Employer and Contractor will designate each completed Sub-section to complete as Ready for Wet Commission (RWC). A request to proceed with wet commissioning will be issued by the Contractor after completion of the dry commission phase.

#### **C3.4.12 WET COMMISSIONING**

After being designate as Ready for Wet Commissioning ,each process will commence with wet commissioning test runs which shall include the same operations as for dry commissioning tests but with the equipment loaded .The Employer will provide suitable raw water or treated water and power as set out by the Contract. The Contractor shall provide the first charge of chemicals.

- a) Performance testing of all equipment at specific duties and efficiencies for at least 24 hours continuously.
- a) Check of levels, flows, pressure and temperatures at minimum and maximum operating conditions for all operation scenarios.
- b) Temperatures of all bearings.
- c) Vibration of rotating elements.
- d) Calibration of dosing equipment
- e) Water tightness tests of installation at full production.
- f) Functional and control loop testing (process level)
- g) Site performance tests on individual equipment as per the testing plan
- h) Performance and control tests on the entire system

After successful of the Wet Commissioning of all equipment and process and the Works as a whole, the trial operation period of the entire system will commence. The Engineer shall confirm in writing the date on which successful wet commissioning was achieved.

#### **C3.4.13 TRIAL OPERATION PERIOD**

On successful completion of the wet commissioning stage the system will be put into service by the contractor. The contractor shall ensure that the system is put into service in compliance with the O&M Manual and the OHC Act and its Regulations.

A detailed procedure for conducting the trial period will be developed and agreed between the contractor and the Employer.

The purpose of the trial operation is to, demonstrate the reliability of the works, system integrity with regards to system losses and evaluate the training effectiveness of the training of the operators.

Once the trial period has commenced, the works will be operated successfully and continuously for a period of six weeks, with interruptions only to alter plant settings, effect final settings and optimization, test auto-functionality and train the operator in the detail functioning of the plant. The Engineer shall confirm in writing the date on which the trial operation period commenced.

During the **6 weeks** trial operation period, the Contractor shall record all operational data and at its completion submit to the engineer a report confirming final settings, calibration, auto control functions, approved tests and successful training of the operator to the satisfaction of the Employer before a Taking-Over Certificate will be issued for the works in terms of clause 32 of the General Conditions of Contract.

The availability of the equipment during the trial operation period shall not be less than 95%.

All failures occurring during the trial period will be subject to a root cause analysis and repaired accordingly by the contractor. A failure investigation analysis and close-out report shall be submitted for each failure of the works and included in the section dealing with total plans and reports.

If declared unsuccessful, the Engineer may request a repeat of the Trial Operation period. Under such circumstances the Contractor shall repeat the Trial Operation Period and Performance Test as indicated herein within three months after the Engineer's request. The costs in performing this, or any further Performance Tests, will be for the Contractor's account.

**C3.4.14 FINAL PERFORMANCE TEST AFTER COMPLETION OF TRIAL PERIOD**

Once the trial period has been completed successfully the Engineer shall set the date of the Final Performance Test.

The Performance Test Shall establish:

- a) The capacity and characteristics of the Works are as specified, and that they meet the performance guarantees.
- b) The works can meet the performance guarantee for all the operating scenarios.

The equipment provided by the Contractor on site to test the performance of the equipment shall include all the instrumentation not included in the permanent installation, (e.g. Energy meter), and all tools and suitable trained staff necessary.

If the outcome of the Performance Test, the Contractor Shall inform Personnel Provided by the Employer of all appropriate technical information derived from the result.

On successful completion of the performance Test a take-over report shall be drawn up by the Contractor and shall be signed by the Engineer.

**C3.4.15 GUARANTEES OF PERFORMANCE**

The Contractor shall guarantee the output and efficiency of all machines, which guarantees shall be binding under the Contract.

The fulfilment of these guarantees shall be demonstrated at the Contractor's factory premises or a suitable off-site test facility approved by the Engineer.

All measuring instruments used in the tests shall have previously been certified by an independent testing authority, not more than one month prior to the test and to the Engineer's satisfaction.

**C3.4.16 LIQUIDATED DAMAGES FOR FAILURES TO ACHIEVE GUARANTEES**

The Contractor shall ensure that the motor control circuits shall be adequately rated to ensure that the motor control circuits shall be adequately rated to ensure that pumps deliver the "required minimum and maximum discharge", by taking whatever action is necessary should there be any shortfall in the quantity of water measured when the pumps are delivering at the total head associated with the "duty point" in fulfilment of the guaranteed Performance criteria.

Payment by the Contractor in lieu of under-performance of the pump sets relative to guaranteed Performance will not be acceptable.

**C3.4.17 DEFECTS NOTIFICATION PERIOD**

All equipment supplied under this contract shall be tested and adjusted where necessary by the operator at the end of the 52 weeks Defects Notification Period, to prove that it continues to comply with the specified requirements.

All failures during the Defects Notification Period shall be investigated as described in elsewhere in this document.

**C3.4.18 TEST PLAN AND REPORTS**

Test reports shall be submitted after the successful completion of each testing phase. The following documents shall be submitted in writing to the Employer:

- a) Testing plan
- b) Progressive testing reports as detailed in the testing plan
- c) Tests on completion: Dry commissioning report and wet commissioning report
- d) Trial operation: Trial operation report and performance test report
- e) Failure investigation reports (where necessary) during defects notification period

#### **C3.4.19 ENGINEERING**

##### **C3.4.19.1 CONTRACTOR'S DESIGN**

The Contractor shall carry out, and shall be responsible for the final design of all the Permanent Works included in this contract. Cable routes and other layout drawings are provided to indicate the general requirement of the Permanent Works and shall be used for tender purposes. The Contractor shall remain responsible for all detail design and final workshop details.

##### **C3.4.19.2 DRAWINGS.**

Drawings are issued in a separate volume.

## **C 3.5 STANDARD AND TECHNICAL SPECIFICATIONS – CIVIL ENGINEERING WORKS**

**C3.5 STANDARD AND TECHNICAL SPECIFICATIONS - CIVIL ENGINEERING WORKS**

**C3.5.1 SCOPE**

These Project Specifications are set out in two portions. Portion 1 covers the general description of the project, the facilities available and the requirements to be met. Portion 2 covers variations and additions to the SANS 1200 Standardised Specifications that are applicable to this Contract.

**C3.5.2 STATUS**

In the event of any discrepancy between the Project Specifications and a part or parts of the SANS 1200 Standardised Specifications, the Schedule of Quantities or the Drawings, the Project Specifications shall take precedence.

**C3.5.3 PORTION 1: THE WORKS**

**PS APPLICABLE STANDARDISED SPECIFICATIONS**

**Portion 1: The Works**

- PS 1 General Description of Works
- PS 2 Description of Site and Access
- PS 3 Nature of Ground and Sub-soil Conditions
- PS 4 Details of Contract
- PS 5 Construction Programme
- PS 6 Site Facilities Available
- PS 7 Site Facilities Required
- PS 8 Features Requiring Special Attention
- PS 9 Preservation of the Site
- PS 10 Key Personnel
- PS 11 Safety Personnel
- PS 12 Site Meetings
- PS 13 Notices to the Engineer
- PS 14 Use of defective Works
- PS 15 SABS 1200 Series Standardized Specifications
- PS 16 Prime cost items and Provisional sums

For the purposes of this Contract, the following SANS 1200 Standardised Specifications shall apply:

- SANS 1200 A : General (1986)
- SANS 1200 C : Site clearance (1982)
- SANS 1200 D : Earthworks (1990)

|              |   |                                   |
|--------------|---|-----------------------------------|
| SANS 1200 DB | : | Earthworks (pipe trenches) (1989) |
| SANS 1200 L  | : | Medium-pressure pipelines (1983)  |
| SANS 1200 LB | : | Bedding (pipes) (1983)            |
| SANS 1200 LD | : | Sewers (1982)                     |
| SANS 1200 LE | : | Stormwater drainage (1982)        |
| SANS 1200 PA | : | Fencing (1984)                    |

Variations and additions to the following SANS 1200 Standardised Specifications are given in **Portion 2** of the Project Specifications:

|              |   |                            |
|--------------|---|----------------------------|
| SANS 1200 A  | : | General                    |
| SANS 1200 C  | : | Site clearance             |
| SANS 1200 D  | : | Earthworks                 |
| SANS 1200 DB | : | Earthworks (pipe trenches) |
| SANS 1200 G  | : | Concrete (structural)      |
| SANS 1200 H  | : | Structural Steel           |
| SANS 1200 HB | : | Cladding and sheeting      |
| SANS 1200 L  | : | Medium-pressure pipelines  |
| SANS 1200 LB | : | Bedding (pipes)            |
| SANS 1200 LD | : | Sewers                     |
| SANS 1200 LE | : | Stormwater drainage        |

**C3.5.4 PORTION 1: THE WORKS**

**PS1 GENERAL DESCRIPTION OF WORKS**

This contract comprises of the retrofitting of 6 sewer pump stations , installation of inline grinders and repairs to waste water treatment plant in hoopstad and tikwana including the supply, delivery, installation, testing, commissioning and handing over of the pumps.

The Contractor's obligations under Contract comprise the construction, completion and maintenance of the Works. The provision of all labour, materials, construction plant, temporary works and everything, whether of a temporary or permanent nature required in and for such construction, completion and maintenance so far as the necessity for providing the same is specified in or reasonably to be inferred in the Contract.

**PS2 DESCRIPTION OF SITE AND ACCESS**

The sites of the works are the existing at Hoopstaad and Tikwana pump stations, which are situated along R700 provincial road between Bloemfontein and the North West Province. The main town is Hoopstad and its twonship is Tikwana.

**PS3 NATURE OF GROUND AND SUBSOIL CONDITIONS**

No geotechnical report will be provided to the Contractor. It is the Contractor's responsibility in terms of the General Conditions of Contract, to satisfy himself as to the conditions on the site and the possible variation thereto due to seasonal effects.

**PS4 DETAILS OF CONTRACT**

- Retrofitting of 6 sewer pump stations .
- Installation of inline grinders.
- Repairs to waste water treatment plant.

**PS 5 CONSTRUCTION PROGRAMME**

**PS 5.1 Time for Completion**

Time is of the essence for this contract. The works shall be completed in a period of four (4) months.

**PS 5.2 Bidder's Programme**

The Bidder shall attach a preliminary programme indicating each portion of the works. The proposed order and rate of progress of the various construction activities shall be consistent with, and in support of, his time required for completion and measured against recorded deliverables.

**PS 5.3 Contractor's Programme**

After award of the Contract, the Contractor shall submit a detailed programme to the Engineer for approval. The Engineer may from time to time during the contract, require this programme to be amended in the interest of the project, and such amended and approved programme shall be adhered to rigidly.

**PS 6 SITE FACILITIES AVAILABLE**

**PS 6.1 Water and Electricity Supply**

The Contractor shall make his own arrangements for the supply and distribution of water and power.

**PS 6.2 Location of Contractor's Camp and Depots**



The Employer, in conjunction with the Engineer, will allocate a suitable area to the Contractors for the erection of temporary site offices and for storing materials.

**PS 6.3 Sources of Construction Materials**

If the existing material is not of the required standard, suitable material will be imported from an approved commercial source. All construction material must be found, selected and supplied by the Contractor him/herself and approved by the Engineer.

**PS 7 SITE FACILITIES REQUIRED**

No existing facilities are available. All the necessary site facilities shall be provided and maintained by the Contractor. The requirements regarding notice boards, laboratories, accommodation and survey equipment for use by the Engineer. etc. are set out in sections PSA and PSAB of the project specification.

**PS 7.1 Temporary Offices and Storage Sheds**

The Contractor shall provide, erect, maintain and remove on completion of the Contract, ample temporary offices and sheds for the proper storage of perishable materials and for the use of his workmen. An office approximately 4m x 5m in size with a desk and 10 chairs is to be provided for the purpose of holding site meetings.

**PS 7.2 Laboratory Facilities**

No laboratory, testing or storage facilities are available from the Employer. The Contractor must make his own arrangements and provide all facilities which must be acceptable to the Engineer for all testing required. Refer also to Clause PSA 4.1

**PS 7.3 Sanitary Facilities**

No separate sanitation facilities for the specific use of the Engineer or his staff need be provided. The Contractor shall provide and maintain adequate and approved temporary ablution and latrine facilities for his workmen on site and remove on completion.

**PS 7.4 Telephone Facilities**

No telephone facilities are available from the Employer. The Contractor is advised to establish his/her own communication facilities from the site to his/her outside organizations.

**PS 7.5 Accommodations for the Engineer**

A separate office is required for the specific use of the Engineer.

**PS 8 FEATURES REQUIRING SPECIAL ATTENTION**

**PS 8.1 Existing Services**

There is little data on the existing services; neither the Employer nor the Engineer will accept the responsibility for the accuracy or for any omission that may have been made.

The Contractor shall take all reasonable steps to protect any existing works against damage which may arise as a result of his operations on the site. The Contractor shall acquaint himself with all existing works. Before any excavation is commenced the Contractor shall submit to the owners of such works plans showing the extent of the proposed excavations together with a programme giving approximate

dates on which excavations will be commenced, and shall where possible, obtain from the owners plans showing the position of all existing works.

Where the Contractor anticipates that it will be virtually impossible for him/her to carry out the work without causing damage to existing services or works, and the Engineer in his discretion feels such damage is likely to occur, the Contractor shall make arrangements with the authority concerned to temporarily remove, deviate, protect or suspend the work or service concerned and pay the costs incurred, which shall be reimbursed to the Contractor.

The Contractor shall be responsible for the proper consolidation of the ground under and around any exposed mains, cables, valves, stopcock boxes and the like. The uncovering of boxes and covers that may become buried during excavation or refilling operation will be at the expense of the Contractor.

When crossing under or running parallel to poles supporting electrical services, they shall be sustained securely in place until the work is complete and shall then be made safe as before.

Where any existing services are crossed or temporarily removed, the Contractor shall be responsible for the repair and/or reinstatement of the crossings to the satisfaction of the owners and the Engineer's Representative.

The Contractor shall be held responsible for damage to any existing works and any damage caused, including any claims, which arise as a result thereof. All such claims shall be borne by the Contractor, unless it is established by the Engineer that the Contractor exercised reasonable care and damage was unavoidable and that the notices were served timeously.

All damage done to existing works shall be immediately notified to the owners concerned and to the Engineer. If so directed by the Engineer, the positions of any existing work shall be changed by the Contractor to meet the requirements of the proposed work and the cost of such changes will be paid for as extra works.

#### **PS 9      PRESERVATION OF THE SITE**

The Contractor shall not start any fires and naked flames/smoking is strictly prohibited.

The Contractor shall not permit the destruction of or injury to, animals or bird life within the site of the works during the period of the contract.

During the progress of the work and at the completion thereof the site is to be kept, and left, in a clean and orderly condition to the satisfaction of the Engineer.

The Contractor shall at all times store materials and equipment for which he is responsible in an orderly manner and shall keep the premises free from debris and obstruction.

Only trees marked and indicated by the Engineer may be removed.

Existing graves are to be identified and protected from damage arising out of construction activities.

#### **PS 10              KEY PERSONNEL**

The Contractor shall furnish the Engineer with a list of addresses and telephone numbers of key personnel in the Contractor's organization who may be contacted in an emergency both during and outside office hours.

#### **PS 11              SAFETY OF WORKMEN**

The safe conduct of the Works shall be a primary consideration and the entire Works (until completion or termination of the contract) shall be carried out in conformity with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) and all other applicable statutory regulations and requirements. Bidders must price their Bids accordingly.

Particular attention is drawn to the following:

If the Contractor has more than 20 employees, a health and safety representative (or representatives) must be designated.

The Contractor is responsible for the compliance with the Act by all his/her subcontractors, whether or not nominated and/or approved by the Employer.

- c) The Contractor accepts sole responsibility for compliance with the relevant duties, obligations and prohibitions by the Act, and expressly absolved the Employer and the Employer's consulting engineer's of responsibility for compliance with the Act in respect of work included in the contract
- d) The Contractor shall be obliged to report forthwith to the Employer any investigation, complaint or criminal charge which may arise as a consequence of the provisions of the Act pursuant to work performed on behalf of the Employer.
- e) The Contractor shall provide and maintain in readiness on the Site, all equipment and materials necessary to render first aid in case of accidents or other emergencies. The Contractor shall also assign to the Works and designate for this purpose, trained employees who are able to render first aid.

#### **PS 12 SITE MEETINGS**

The Engineer shall hold regular site meetings and keep and circulate minutes. The Contractor shall attend and shall ensure that all sub-contractors are represented when required by the Engineer.

#### **PS 13 NOTICES TO THE ENGINEER**

Apart from the specific notice periods called for in the Contract Documents, the Contractor shall give the Engineer forty eight (48) hours notice of any work requiring inspection by the Engineer. No further subsequent work dependent on such approval may be undertaken until confirmation of such receipt by the Engineer has been received.

#### **PS 14 USES OF DEFECTIVE WORKS**

Should any of the works be found to be not in accordance with the Contract, the Client shall have the right to use such defective works until the Contractor shall have rectified the defect or replaced the defective works with works complying with the Contract, without prejudice to any of the Client's rights under the Contract and without incurring any obligation in respect of the use of the defective works.

#### **PS 15 SABS 1200 SERIES STANDARDIZED SPECIFICATIONS**

The Contractor shall provide on site a copy of the relevant sections of both SANS 1200 Series Standardized Specification and the related 0120 Code of Practice.

#### **PS 16 PRIME COST ITEMS AND PROVISIONAL SUMS**

In cases of any provisional sum set out in the Schedule of Quantities for work which has not been specified or scheduled in detail when the contract is entered into, where work to which the provisional sum relates has been ordered by the Engineer and such work is: -

- a) Executed by the Contractor, it shall be valued in accordance with Clause 6.4 of the General Conditions of Contract,

- b) Executed by a Sub-Contractor, the Contractor shall be reimbursed the sum or sums he actually paid to the Sub-Contractor plus either:-
- i) A commission of 7,5% (seven and one half percent) on the sum or sums actually paid to the Sub-Contractor, irrespective of by whom payment is made to the Sub-Contractor, or
  - ii) If the Contractor shall have added to the provisional sum in question, a sum in respect of charges and profits, a sum in the same proportion to the amount paid to the provisional sum.

Where sums are stated in the Schedule of Quantities to be provided to cover the prime cost (P.C.) for goods or materials to be supplied under the Contract, the amount to therefore be paid to the Contractor shall be the actual price paid by him in substitution for the prime cost sum, together with any charge included by the Contractor in his Bid for labour, profit, carriage, establishment and other charges.

When required by the Engineer, the Contractor shall produce all invoices, vouchers and receipts in respect of payments made by him in connection with provisional or prime cost items.

### **C3.5.5 PORTION 2: VARIATIONS FROM STANDARD SPECIFICATIONS**

#### **PSC 2 CONSTRUCTION**

##### **PSD SABS 1200 D: EARTHWORKS**

#### **PSD 3 MATERIALS**

##### **PSD 3.1 Classification for Excavation Purposes**

Classification of material other than soft shall be agreed upon prior to excavation commencing. The Contractor shall immediately inform the Engineer if and when the nature of the material being excavated warrants a new classification. Failure on the part of the Contractor to notify the Engineer timeously shall entitle the Engineer to classify the material at his discretion.

#### **PSD 5 CONSTRUCTION**

##### **PSD 5.2 Methods and Procedures**

##### **PSD 5.2.2.4 Selection and Stockpiling**

The Contractor shall select suitable material from the excavated and stockpiled materials for which use it is intended, disregard unsuitable material and reserve material for other purposes as necessary. When required and as ordered by the Engineer, material shall be stockpiled for later use when excavation thereof is unavoidable in order to excavate the material required at the time.

##### **PSD 5.2.5.1 Free-haul**

All haul within the site of works or within a distance of 2,0 km outside the of the boundaries of the Contract as indicated on the drawings shall be regarded as free-haul.

#### **PSD 8 MEASUREMENT AND PAYMENT**

##### **PSD 8.1 Basic Principles**

Further to the requirements of Clause 8.1, no allowances will be made for bulking and/or shrinkage. It shall be assumed that 1 cubic metre of excavated material from the site shall form 1 cubic metre of compacted fill. Measurements for bulk earthworks shall be from topographical survey and DTM modeling. No extra or separate payment will be made for work considered to be of a restricted nature.

#### **PSDB EARTHWORKS (PIPE TRENCHES)**

**PSDB 3 MATERIALS**

**PSDB 3.5 BACKFILL MATERIALS**

"(c) Cement-stabilized backfilling

Backfilling shall, where directed by the Engineer, be stabilized with 5% cement. The aggregate shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed with 5% cement and shall be compacted in layers of 100 mm thick to 90% of modified AASHTO density.

(d) Soilcrete backfilling

The aggregate for soilcrete shall be mixed with 5% cement and shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed in a concrete mixer with the cement and enough water to acquire a consistency that allows the mixture to be placed with vibrators to fill all voids between the pipe and the sides of the trench. Shuttering shall be used where necessary."

**PSDB 5 CONSTRUCTION**

**PSDB 5.1 PRECAUTIONS**

**PSDB 5.1.3 Accommodation of traffic and access to properties**

(b) Where necessary to achieve compliance by the Contractor with his obligations in terms of subclause PS 8.5 of Portion 1 of the Project Specifications to provide and maintain pedestrian and vehicular access to properties affected by the works, the Contractor shall construct and maintain to the satisfaction of the Engineer, such temporary access roads around, and/or steel or timber bridges over excavations in roads, pavements, entrances or accesses to properties.

Temporary pedestrian access bridges shall be at least 1,2 m wide and temporary access bridges for vehicles shall be at least 3,6 m wide. All temporary access bridges shall be fitted with handrails as well as protective mesh fencing on both sides.

On completion of the work, the Contractor shall dismantle and remove all such temporary constructions and reinstate these areas to their former condition.

Except only where the Engineer has included in the Schedule of Quantities, particular payment items specifically therefor, the Contractor will not be paid directly for the construction and maintenance of temporary access roads and/or the provision and maintenance of bridges as aforementioned, and the costs thereof shall be deemed included in the Contractor's tendered rates for excavation."

**PSDB 5.2 MINIMUM BASE WIDTHS**

The specified width of trenches and the width of the excavation measured for payment shall not be less than 0,5 m, but the Contractor may reduce the actual width with the Engineer's permission."

**PSDB 5.4 EXCAVATION**

"Except where otherwise specified, trenches shall be of such a depth that the minimum cover over the pipes shall be 800 mm except at road-crossings where the minimum cover shall be 1 000 mm."

**PSDB 5.6 BACKFILL**

**PSDB 8 MEASUREMENT AND PAYMENT**

**PSDB 8.3 SCHEDULED ITEMS**

**PSDB 8.3.2 Excavation**

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

*REPLACE "of 1,0 m" IN THE FIRST SENTENCE OF 8.3.2(a) WITH:*

*"as specified in the Tender Drawings."*

- (b) Extra over item (a) above for:

"No payments will be made under subitems (1) and (2) in respect of any materials measured and paid for under subitem 3 below."

"(3) Hand excavation where ordered by the Engineer in:

- (a) Soft material Unit: m<sup>3</sup>
- (b) Intermediate material Unit: m<sup>3</sup>
- (c) Hard material Unit: m<sup>3</sup>

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

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

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

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

and/or

(4) Backfill stabilized with 5% cement where directed

by the Engineer Unit: m<sup>3</sup>

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

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

(5) Soilcrete backfill where directed by the Engineer Unit: m<sup>3</sup>

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

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

- "(d) Excavate in all materials for stormwater inlet and outlet structures and for manholes, catchpits, valve chambers and the like, irrespective of depth, and backfill around structures: Unit: m<sup>3</sup>

The unit of measurement shall be the cubic metre of material excavated, measured in place according to the authorised dimensions, and excluding the volume of material excavated and paid for under subitem (a).

The tendered rate shall include for the costs of excavating in all materials, backfilling, compacting, trimming and tidying the final surface around the structure, disposing of surplus and unsuitable materials within the free-haul distance and, where applicable, selecting and keeping separate, excavated material suitable for use as backfill.

- (e) Excavate open drains in all materials Unit: m<sup>3</sup>

The tendered rates shall include full compensation for excavating in all materials within the dimensions specified or authorised by the Engineer and to the specified lines and profiles, for the disposal of surplus and unsuitable excavated material where applicable, and in the case of item (d), for backfilling with suitable approved material compacted to 90% of modified AASHTO density around the structures.

- (f) Extra over subitems (d) and (e) for excavating in:

- (1) Intermediate material Unit: m<sup>3</sup>
- (2) Hard rock material Unit: m<sup>3</sup>

Measurement and payment shall be in accordance with the provisions of 8.3.2(b) of SABS 1200 D (as amended)."

**PSDB 8.3.3 Excavation ancillaries**

**PSDB 8.3.3.3 Compaction in road reserves**

**"PSDB 8.3.3.3 Compaction in road crossings"**

"To determine the volume in the case of gravel roads, the depth will be measured from the underside of the gravel wearing course to the top of the fill blanket, and in the case of bitumen roads, from the underside of the subbase to the top of the fill blanket.

The rest of the trench shall be backfilled as specified in clauses 5.9.3, 5.9.4 and 5.9.5, as applicable, and payment will be made under item 8.3.6.1."

**PSDB 8.3.7 "Accommodation of traffic** Unit: sum

The tendered sum shall, (except where particular items are scheduled to cover particular costs) include full compensation for compliance with the requirements of 5.1.3 of SABS 1200 DB (as amended), including the construction and maintenance of bypasses and the use of existing roads as bypasses during the construction period.

It shall also include full compensation: for the provision, maintenance and removal of all traffic control measures, including temporary traffic signs, road markings, lighting, barricading, flagmen and, where

necessary, communications equipment to regulate traffic; for the construction of temporary drainage works; for the maintenance of drainage works; and for arrangements for moving and subsequently reinstating services for the purposes of accommodating traffic, attending to traffic problems and complying with the requirements of the Road Traffic Ordinance and the relevant local authorities.

The tendered lump sum shall not be adjusted in the event of any extension of time for completion being granted by the Engineer in accordance with Clause 45 of the Conditions of Contract.

Payment shall be made in equal monthly installments over the entire period allowed for completion, provided that where any extension of time for completion is granted, the amount which shall be payable under this item in any subsequent monthly payment certificate shall be the outstanding unpaid amount of the lump sum, divided by the number of months remaining until the due completion date of the Contract, as revised in accordance with the Conditions of Contract."

**PSL                    MEDIUM-PRESSURE PIPELINES**

**PSL 3                MATERIAL**

**PSL 3.7            OTHER TYPES OF PIPES**

**PSL 3.7.1        uPVC pipes**

*ADD THE FOLLOWING:*

"Pipes and couplings should conform to SANS."

**PSL 3.7.2        Polyethylene pipes**

"Polyethylene pipes compression fittings shall be as shown the Tender drawings and shall comply with SABS 533 Part II."

"Valves shall comply with the following requirements:

- (a) They shall open/close clockwise and shall have a non-rising spindle and handwheel.
- (b) They shall be class 16 valves complying with SABS 664.
- (c) They shall comply with the requirements of SABS 1123 table 1600.

**PSL 7                TESTING**

**PSL    7.3        STANDARD HYDRAULIC PIPE TEST**

**PSL 7.3.1        Test pressure and time of test**

**PSL 7.3.1.2      The maximum working pressure for the different pipes is indicated by the class of the pipe.**

**PSL 8               MEASUREMENT AND PAYMENT**

**PSL 8.2           SCHEDULED ITEMS**

**PSL 8.2.18       Connection to existing main supply**

The rate shall include all the installation of any coupling required by the connection and approval thereof by the relevant Authority.

**PSLB   BEDDING (PIPES)**



### PSLB 3 MATERIALS

#### PSLB 3.1 SELECTED GRANULAR MATERIAL :

"Selected granular material shall have a PI not exceeding 6 and shall be free from sharp-edged particles exceeding 19 mm."

#### PSLB 3.2 SELECTED FILL MATERIAL

"Selected fill material used for bedding shall be stabilized with 5% cement as specified under subclause PSDB 3.5(c)."

#### PSLB 3.3 BEDDING

"uPVC and HDPE pipes are deemed to be flexible pipes for the purposes of this subclause."

#### PSLB 3.4 SELECTION

##### PSLB 3.4.1 Suitable material available from trench excavation

*REPLACE THE WORDS "(but is not required)" IN THE FIFTH LINE WITH THE WORDS "(at his own cost)".*

#### PSME 5 CONSTRUCTION

#### PSME 8 MEASUREMENT AND PAYMENT

##### PSME 8.1 BASIC PRINCIPLES

"(d) that, in the case of material from a commercial source or from borrow pits selected by the Contractor, no additional payment will be made for the class of excavation, method of processing (except stabilizing), or overhaul."

##### PSME 8.3 SCHEDULED ITEMS

**PSME 8.3.2** Construct the subbase course/shoulders/gravel wearing course with material from designated excavations

"The rate for (a) shall include full compensation for excavating and selecting subbase material, for loading and transporting the material within the free-haul distance, and for either placing the material on the road or stockpiling the material for later use. When material is stockpiled, the rate shall include compensation for shaping and grading the stockpile so that it is free-draining."

**PSME 8.3.3** Construct the subbase course/shoulders/gravel wearing course with material from commercial sources or designated borrow areas

**"PSME 8.3.3** Construct the subbase course/shoulders/gravel wearing course with material from commercial sources"

"This item shall also apply to the construction of subbase course/shoulders/gravel wearing course with material from borrow pits selected by the Contractor."

**PSME 8.3.9** Overhaul (haul exceeding 2 km):

"(a) Limited overhaul Unit: m<sup>3</sup>

(b) Long overhaul Unit: m<sup>3</sup>-km

Overhaul will be paid in accordance with item 8.3.6 of SABS 1200 D."

## **C 3.6 HIV/AIDS REQUIREMENT**

## **C3.6 HIV/AIDS REQUIREMENTS**

### **C3.6.1 SCOPE**

This specification contains all requirements applicable to the Contractor for creating HIV/AIDS awareness amongst all of the Workers involved in this project for the duration of the construction period, through the following strategies:

- Raising awareness about HIV/AIDS through education and information on the nature of the disease, how it is transmitted, safe sexual behaviour, attitudes towards people affected and people living with HIV/AIDS, how to live a healthy lifestyle with HIV/AIDS, the importance of voluntary testing and counselling, the diagnosis and treatment of Sexually Transmitted Infections and the closest health Service Providers
- Informing Workers of their rights with regard to HIV/AIDS in the workplace
- Providing Workers with access to condoms and other awareness material that will enable them to make informed decisions about sexual practices

### **C3.6.2 DEFINITIONS AND ABBREVIATIONS**

#### **C3.6.2.1 Definitions**

Service Provider: The natural or juristic person recognised and approved by the Tswelopele Local Municipality as a specialist in conducting HIV/AIDS awareness programmes.

Service Provider Workshop Plan: A plan outlining the content, process and schedule of the training and education workshops, presented by a Service Provider which has been approved by the Representative/Agent.

Worker: Person in the employ of the Contractor or under the direction or supervision of the Contractor or any of his Sub-contractors, who is on site for a minimum period of 30 days in all.

#### **C3.6.2.2 Abbreviations**

HIV : Human Immunodeficiency Virus  
AIDS : Acquired Immune Deficiency Syndrome  
STI : Sexually Transmitted Infection

**C3.6.3 BASIC METHOD REQUIREMENT**

The Contractor shall, through a Service Provider, conduct onsite workshops with the Workers.

The Service Provider shall develop and compile a Service Provider Workshop Plan to be presented at the workshops and which will be best suited for this project to achieve the specified objectives with regard to HIV/AIDS awareness.

The Service Provider Workshop Plan shall be based on the following information provided by the Contractor:

- Number of Workers and Sub-contractors on site
- When new Workers or Sub-contractors will join the construction project
- Duration of Workers and Sub-contractors on site
- How the maximum number of Workers can be targeted with workshops
- How the Contractor prefers workshops to be scheduled, e.g. three hourly sessions per Worker, or one 2.5 hour workshop per Worker
- Profile of Workers, including educational level, age and gender (if available)
- Preferred time of day or month to conduct workshops
- A Gantt chart reflecting the construction programme, for scheduling of workshops
- Suitable venues for workshops The Contractor shall submit the Service Provider Workshop Plan for approval within 21 days after the tender acceptance date. After approval by the Tswelopele Local Municipality Representative/Agent, the Contractor shall make available a suitable venue that will be conducive to education and training.

The Service Provider Workshop Plan shall address, but will not be limited to the following:

- 3.1 The nature of the disease;
- 3.2 How it is transmitted;
- 3.3 Safe sexual behaviour;
- 3.4 Post exposure services such as voluntary counselling and testing (VCT) and nutritional plans for people living with HIV/AIDS;
- 3.5 Attitudes towards other people with HIV/AIDS;
- 3.6 Rights of the Worker in the workplace;
- 3.7 How the Awareness Champion will be equipped prior to commencement of the HIV/AIDS awareness programme with basic HIV/AIDS information and the necessary skills to handle questions regarding the HIV/AIDS awareness programme on site sensitively and confidentially;
- 3.8 How the Service Provider will support the Awareness Champion;
- 3.9 Location and contact numbers of the closest clinics, VCT facilities, counselling services and referral systems;
- 3.10 How the workshops will be presented, including frequency and duration;
- 3.11 How the workshops will fit in with the construction programme;
- 3.12 How the Service Provider will assess the knowledge and attitude levels of attendees to structure workshops accordingly;
- 3.13 How the video will be used;

3.14 How the Service Provider will elicit maximum participation from the Workers;

3.15 A questions and answers slot (interactive session)

The Service Provider Workshop Plan shall encompass the Specific Learning Outcomes (SLO) as stipulated.

#### **C3.6.4 HIV/ AIDS AWARENESS EDUCATION AND TRAINING**

##### **4.1 Workshops**

The Contractor shall ensure that all Workers attend the workshops.

The workshops shall adequately deal with all the aspects contained in the Service Provider Workshop Plan. A video of HIV/AIDS in the construction industry, which can be obtained from all Offices of the Tswelopele Local Municipality, is to be screened to Workers at workshops. In order to enhance the learning experience, groups of not exceeding 25 people shall attend the interactive sessions of the workshops.

##### **4.2 Recommended practice**

###### **4.2.1 Workshop Schedule**

Presenting information contained in the Service Provider Workshop Plan can be divided in as many workshop sessions as deemed practicable by the Contractor, provided that all Workers are exposed to all aspects of the workshops as outlined in the Service Provider Workshop Plan. Breaking down the content of information to be presented to Workers into more than one workshop session however, has the added advantage that messages are reinforced over time while providing opportunity between workshop sessions for Workers to reflect and test information. Workers will also have an opportunity to ask questions at a following session.

###### **4.2.2 Service Providers**

A database of recommended Service Providers is available from all Offices of the Tswelopele Local Municipality.

###### **4.2.3 HIV/AIDS Specific Learning Outcomes and Assessment Criteria**

Workers shall be exposed to workshops for a minimum duration of two-and-a-half hours. In order to set a minimum standard requirement, the following specific learning outcomes and assessment criteria shall be met

###### **4.2.3.1 UNIT 1: The nature of HIV/AIDS**

After studying and understanding this unit, the Worker will be able to differentiate between HIV and AIDS and comprehend whether or not it is curable. The Worker will also be able to explain how the HI virus operates once a person is infected and identify the symptoms associated with the progression of HIV/AIDS.

Assessment Criteria:

1. Define and describe HIV and AIDS
2. List and describe the progression of HIV/AIDS

###### **4.2.3.2 UNIT 2: Transmission of the HI virus**

After studying and understanding this unit, the Worker will be able to identify bodily fluids that carry the HI virus. The Worker will be able to recognise how HIV/AIDS is transmitted and how it is not transmitted.

Assessment Criteria:

1. Record in what bodily fluids the HI virus can be found
2. Describe how HIV/AIDS can be transmitted
3. Demonstrate the ability to distinguish between how HIV/AIDS transmitted and misconceptions around transmittance of HIV/AIDS

#### **4.2.3.3 UNIT 3: HIV/AIDS preventative measures**

After studying and understanding this unit, the Worker will comprehend how to act in a way that would minimise the risk of HIV/AIDS infection and to use measures to prevent the HIV virus from entering the bloodstream.

Assessment Criteria:

1. Report on how to minimise the risk of HIV/AIDS infection
2. Report on precautions that can be taken to prevent HIV/AIDS infection
3. Explain or demonstrate how to use a male and female condom.
4. List the factors that could jeopardize the safety of condoms provided against HIV/AIDS transmission

#### **4.2.3.4 UNIT 4: Voluntary HIV/AIDS counselling and testing**

After studying and understanding this unit, the Worker will be able to recognise methods of testing for HIV/AIDS infection. The Worker will be able to understand the purpose of voluntary HIV/AIDS testing and pre- and post-test counselling.

Assessment Criteria:

1. Describe methods of testing for HIV/AIDS infection
2. Report on why voluntary testing is important
3. Report on why pre- and post-test counselling is important

#### **4.2.3.5 UNIT 5: Living with HIV/AIDS**

After studying and understanding this unit, the Worker will be able to recognise the importance of caring for people living with HIV/AIDS and be able to manage HIV/AIDS.

Assessment Criteria:

1. List and describe ways to manage HIV/AIDS
2. Describe nutritional needs of people living with HIV/AIDS
3. Describe ways to embrace a healthy lifestyle as a person living with HIV/AIDS
4. Explain the need for counselling and support to people living with HIV/AIDS

#### **4.2.3.6 UNIT 6: Treatment options for people with HIV/AIDS**

After studying and understanding this unit, the Worker will be familiar with the various treatments available to HIV/AIDS infected or potentially HIV/AIDS infected people.

Assessment Criteria:

1. Discuss anti-retroviral therapy
2. List methods of treatment to prevent HIV/AIDS transmission from mother-to-child
3. Describe the need for treatment of opportunistic diseases for people living with HIV/AIDS
4. Describe post exposure prophylactics.

**4.3 Displaying of plastic laminated posters and distribution of information booklets**

The Contractor shall obtain a set of four laminated posters conveying different key messages and information booklets, which are available from Offices of the Tswelopele Local Municipality.

The above-mentioned posters and information booklets have been prepared to raise awareness and to share information about HIV/AIDS and STI's.

Posters or display stands shall be displayed on site as soon as possible, but not later than 14 days after the date of site handover.

Posters shall be displayed in areas highly trafficked by Workers, including toilets, rest areas, the site office and compounds.

The posters on display must always be intact, clear and readable.

Information booklets must be distributed to all Workers as soon as possible, but not later than 14 days after site handover, or as soon as the Worker joins the site.

**5. PROVIDING WORKERS WITH ACCESS TO CONDOMS**

The Contractor shall provide and maintain condom dispensers and make both male and female condoms, complying with the requirements of SABS ISO 4074, available at all times to all Workers at readily accessible points on site, for the duration of the contract. The Contractor may obtain condom dispensers from the Department of Health and condoms may be obtained from the Local Clinic or the Department of Health.

At least one male and one female condom dispenser and a sufficient supply of condoms, all to the approval of the Representative/Agent, shall be made available on site within 14 days of site hand over. Contractors should note that arrangements to obtain condoms from the Department of Health Clinics prior to site hand over may be necessary, to ensure that condoms are available within 14 days of site handover.

Condoms shall be made available in areas highly trafficked by Workers, including toilets, the site office and compounds.

**C3.6.5 ENSURING ACCESS TO HIV/AIDS TESTING AND COUNSELLING FACILITIES AND TREATMENT OF SEXUALLY TRANSMITTED INFECTIONS (STI)**

The Contractor shall provide Workers with the names of the closest Service Providers that provide HIV/AIDS testing and counselling and Clinics providing Sexually Transmitted Infection (STI) diagnosis and treatment. Information on these Service Providers and Clinics must be displayed on a poster of a size not smaller than A1 in an area highly trafficked by Workers.

**C3.6.6 APPOINTMENT OF AN HIV/AIDS AWARENESS CHAMPION**

Within 14 days of site handover the Contractor shall appoint an Awareness Champion from amongst the Workers, who speaks, reads and writes English, who speaks and understands all the local languages spoken by the Workers and who shall be on site during all stages of the instruction period.

The Contractor shall ensure that the Awareness Champion has been trained by the Service Provider on basic HIV/AIDS information, the support services available and the necessary skills to handle questions regarding the HIV/AIDS programme in a sensitive and confidential manner.

The Awareness Champion shall be responsible for:

7.1 Liaising with the Service Provider on organizing awareness workshops;

- 7.2 Filling condom dispensers and monitoring condom distribution;
- 7.3 Handing out information booklets;
- 7.4 Placing and maintaining posters

#### **C3.6.7 MONITORING**

The Contractor shall grant to the Representative/Agent reasonable access to the construction site, in order to establish that the Contractor complies with his obligations regarding HIV/AIDS awareness under this contract.

The Contractor must report problems experienced in implementing the HIV/AIDS requirements to the Representative/Agent.



## **C 3.7 OCCUPATION HEALTH AND SAFETY**

### **C3.7 OCCUPATIONAL HEALTH AND SAFETY**

#### **C3.7.1 GENERAL**

##### **C3.7.1.1 Tender Document**

This document is the pre-contract Health and Safety Specification which must be used by the Principal Contractor and Sub Contractors appointed by the Principal Contractor to compile Health and Safety Plans for this project and forms part of the tender documentation.

The Principal Contractor and Sub Contractors' particular attention is drawn to this specification whereby

"Upon award of the contract, the contractor is to assume and adopt the function and duties of the Principal Contractor as set out in the Construction Regulations 2003 No. R. 1010 promulgated 18 July 2003."

The health and safety specifications outlined herein must be taken into account and due allowance made within the pricing of appropriate items contained within the specification. Where the tenderer is of the opinion that a requirement is missing or is not adequately specified then this shall be drawn to the Client attention during the tender period. In the absence of any direction to the contrary, the tenderer shall as part of the tender submission, set out the details of such discrepancy together with the costs associated therewith, separately identified and included within the tender figure.

##### **C3.7.1.2 Principal Contractor**

The successful tenderer will on signing of the contract for:

**Project Name: RETROFITTING OF 6 sewer pump stations , INSTALLATION OF INLINE GRINDERS AND REPAIRS TO WASTE WATER TREATMENT PLANT IN HOOPSTAD AND TIKWANA**

be required to fulfil the function and duties of the Principal Contractor as set out in the Construction Regulations 2003 No. R.1010 promulgated 18 July 2003.

##### **C3.7.1.3 Start of Construction Phase**

The construction phase shall not commence until the Principal Contractor's Health and Safety Plan was considered and approved by the Client and Design Team. The Client shall discuss and negotiate with the Principal Contractor the contents of the Health and Safety Plan submitted by the Principal Contractor before finally approving it for implementation.

The construction phase shall not commence until written permission is received from the Client. In this respect the Client may rely on the advice of the Technical Team as to the adequacy and comprehensiveness of the Plan offered by the Principal Contractor.

In preparing their detailed Health and Safety Plan based on the relevant sections of this Health and safety Specifications supplied to them by the Client, contractors must allow for the adoption of safe working procedures and co-ordinate and rationalize activities to avoid controllable hazards arising due to clashes of activities.

#### **C3.7.2 SUB-CONTRACTORS, SUPPLIERS & DESIGNERS**

The Principal Contractor shall ensure that all direct appointments in connection with this project include provisions for the compliance of his sub-contractors, suppliers and designers, etc., with the relevant provision of the Occupational Health and Safety Act (Act 85 of 1993) and it's Regulations, in particular the Construction Regulations 2003 No. R. 1010 promulgated 18 July 2003.



#### **C3.7.2.1 liaison**

The Principal Contractor shall together with all his appointees, liaison with the Client as required under the Regulations and agrees procedures for the transfer of relevant Information in respect of designs and in connection with the preparation of the Health and Safety File.

#### **C3.7.2.2 Advice**

The tenderer shall, as part of the tender submission, indicate where advice will or may be required of the Client in respect of the competence of the tenderer's designers and the adequacy of resources allocated or to be allocated by them.

#### **C3.7.2.3 Undertaking by Principal Contractor and Sub-Contractors appointed by the Principal Contractor.**

The Principal Contractor as well as Sub-Contractors appointed by him / her shall undertake in writing to ensure that the provisions of the Occupational Health and Safety Act (Act 85 of 1993) and it's Regulations, in particular the Construction Regulation of 2003 No. R 1010 and any amendments or re-enactments thereto are complied with.

The attached Occupational Health and Safety provisions undertaking form for the Principal Contractor shall be completed and signed by the Project Manager of the company / firm awarded the tender.

Client's Occupational Health and Safety Agent: To be appointed

### **C3.7.3 INFORMATION REQUIREMENTS**

The contractor must provide the following information.

#### **C3.7.3.1 General**

- The Principal Contractor / Sub-Contractor shall have an OHS Policy in accordance with the OHS(Occupational Health and Safety Act, Act 85 of 1993) and include a copy of the Policy in the Health and Safety Plan to be submitted by the Principal Contractor / Sub-Contractor.
- The Principal Contractor / Sub-Contractor shall promptly display a copy of the Company's OHS Policy on the OHS Notice Board for the duration of the contract and include it into information provided to persons at the contract OHS induction.
- The Principal Contractor shall develop a Contract specific OHS Management Commitment Statement based on the Company's OHS Policy.
- The Principal Contractor's Project Managing shall sign the Commitment statement and prominently display a copy on the OHS Notice Board for the duration of the contract. A copy of the Commitment Statement shall be included in information provided to persons at the Contract OHS induction and a copy shall also be supplied to each sub-contractor.

#### **C3.7.3.2 Management**

- Details of the personnel and management systems to be put in place to prepare, manage, implement, conduct and monitor the Health and Safety Plan for the project.

Broadly speaking your:

- Organization's internal structure that establishes SHE (Safety, Health and Environmental) ROLES, RESPONSIBILITIES, ACCOUNTABILITIES, and REPORTING RELATIONSHIPS,

- SHE (Safety, Health and Environmental) PLANS, POLICIES, PROCEDURES, DIRECTIVES and STANDARDS that provide instructions as to how activities and functions are to be carried out,
- SHE (Safety, Health and Environmental) CONTROLS, INSPECTIONS, REVIEWS, etc. built into construction operations to ensure that performance is consistent with SHE (Safety, Health and Environmental) objectives and requirements,
- SHE (Safety, Health and Environmental) COMMUNICATION MECHANISMS for collecting, handling and reporting information.

In other words Management Systems that specifies WHO is going to do WHAT, WHERE, WHEN, WHY and HOW.

- Details of relevant qualifications and experience held by the persons nominated above, including recent health and safety education and training undertaken.
- Procedures for determining the competence of contractors engaged on the project, whether employed by the contractor directly or by others, to fulfil their duties under the Construction Regulations 2003 (No. R.1010 Promulgated 18 July 2003)

#### **C3.7.3.3 HAZARD IDENTIFICATION, RISK MANAGEMENT AND CONTROL**

- The Principal Contractor / Sub-Contractor shall detail and implement procedures that will identify hazards, assess risks and determine suitable control measures as they arise throughout term of the contract. These procedures shall both comply with and be implemented and managed in accordance with the specification.
- The Principal Contractor / Sub-Contractor shall detail and implement procedures that ensure control measures are evaluated for effectiveness and modified as necessary. The evaluation procedure shall detail the responsibilities, timelines and records that will be kept as part of the process.
- Where Risk is controlled through administrative control measures, the Principal Contractor / Sub-Contractor shall ensure that the administrative measures are:
  - a) Clearly documented and those personnel responsible for implementation and management are explicitly defined;
  - b) Understood by all relevant personnel through training and assessment;
  - c) Implemented as documented and promptly reviewed for effectiveness following initial implementation;
  - d) Amended and authorised as required;
  - e) Adequately supervised, managed and audited to ensure continuing compliance;
  - f) Available at all times wherever the measures are being implemented.
- ❖ Any piece of plant or equipment not complying with the specification shall cease operation until the Principal Contractor / Sub-Contractor can demonstrate to the satisfaction of the Client / Client's Agent that the piece of non-conforming plant or equipment conforms to these requirements.

#### **C3.7.3.4 Health and Safety Plan**

The Principal Contractor / Sub-Contractor shall develop a Health & Safety Plan to reflect variations in design or changes in site conditions and liaise with the Client / Client's Agent.

The Principal Contractor shall develop this Health and Safety Plan so that it:

- a) Incorporates the contractor's approach to managing the construction work to ensure the health and safety of all persons carrying out the construction work and all persons who may be affected by their work.
- b) Includes the risk assessments prepared by all Contractors under their duties set out in the Construction Regulations 2003 and any other relevant legislation (i.e. the OHS Act and Regulations, etc.).
- c) Includes the arrangements for ensuring that, where appropriate or specifically requested, all Contractors / Sub-Contractors prepare suitable and sufficient method statements for their construction works which incorporate adequate measures for ensuring the health and safety of all persons who may be affected by these works.
- d) Incorporates the common arrangements for site safety, statutory notices and registers etc.
- e) Includes the site rules to be adopted for controlling the risks to health and safety during the construction phase(s) or the project.
- f) Includes reasonable arrangements for monitoring compliance with health and safety legislation and site rules.
- g) Includes reasonable measures to ensure co-operation between all Contractors and Sub-Contractors in respect of health and safety provisions and prohibitions.
- h) Includes the steps to be taken to ensure that only authorised persons are allowed into any premises or parts of the site / premises where construction work is being carried out.
- i) Includes arrangements for emergency procedures.
- j) Includes arrangements for ensuring that, so far as is reasonably practicable, every Contractor and Sub-Contractor is provided with comprehensible information about the risks to health and safety of that Contractor / Sub-Contractor, or of any employees or other persons under their control, arising out of the construction works, including the emergency procedures
- k) Includes details of the arrangements for ensuring, so far as is reasonably practicable, that the employees or other persons under the control of any Contractor / Sub-Contractor, and any visitors to the site, receive adequate information about the risks to their health and safety arising out of the construction works and, where necessary, adequate training to carry out their work in a safe and healthy manner.
- l) Includes arrangements for providing all persons at work on the site and visitors to the site with the opportunity and means of discussing and offering advice on health and safety issues relating to the construction works.
- m) Includes arrangements for the reporting of any accidents, injuries or dangerous occurrences, including conforming to the statutory requirements.
- n) Can be modified as the work proceeds to take account of any information received from Contractors / Sub-Contractors, any experience gained during the course of the project or any changes necessary as a result of unforeseen circumstances or alterations to the design.

#### **C3.7.3.5 PROGRAMME**

A time estimate required by the contractor to implement the Health & Safety Plan sufficiently for works to commence on site.

#### **C3.7.3.6 Cost**

A detailed breakdown of costs allowed in the contractor's tender for preparing, managing, implementing and monitoring the Health and Safety Plan, and for complying with the requirements imposed on the Principal Contractors under the Construction Regulations of 2003(No. R. 1010 Promulgated 18 July 2003).

### **C3.7.4 GENERAL SITE SAFETY**

#### **C3.7.4.1 Safety training & education**

The Principal Contractor shall detail the OHS competencies and training received by its contract management personnel.

The Principal Contractor's Health and Safety Plan shall have a detailed register of the skills and competencies for all personnel for the activities that the personnel will undertake under the contract. (e.g. Mobile plant operators, crane operators etc.)

The Principal Contractor shall demonstrate and maintain documentary evidence of competencies on site for the duration of the contract.

#### **C3.7.4.2 Induction Training**

The Principal Contractor / Sub-Contractor shall develop and detail a Site Induction Training Programme as part of the Occupational Health and Safety Plan to be submitted to the Client prior to commencement of construction that includes as a minimum:

- a) Training related to hazards likely to be encountered on Site and control measures that have been developed in response to these hazards;
- b) Roles and Responsibilities;
- c) The requirements of the Health and Safety Plan submitted and approved
- d) Address the identified issues in the Fire Safety, Emergency, Evacuation and Rescue Plan to ensure that all Site personnel are aware of procedures in the event of an incident or emergency occurring;

The Principal Contractor / Sub-Contractor shall evaluate all persons undertaking the site Induction Training through a written test to ensure that inductees have an understanding of the OHS (Occupational Health and Safety) requirements for the contract. The written tests shall be signed and dated by the person undertaking the induction training to attest to their understanding and be retained by the Principal Contractor / Sub-Contractor as a record that the training has been completed.

#### **C3.7.4.3 Induction training for specified work**

The Principal Contractor / Sub-Contractor shall conduct Site Specific Occupational Health and Safety Induction Training for all personnel, the Client and all visitors not escorted on Site by inducted persons.

The Principal Contractor / Sub-Contractor shall evaluate all persons undertaking the Site Induction Training through a written test to ensure that inductees have an understanding of the OHS (Occupational Health and Safety) requirements for the contract. The written tests shall be signed and dated by the person undertaking the induction training to attest to their understanding and be retained by the Principal Contractor / Sub-Contractor as a record that the training has been completed.

#### **C3.7.4.4 Recording & reporting of injuries**

Make arrangements for all contractors to report accidents, ill health and dangerous occurrences notifiable to the Department of Labour under Section 24 of the OHS Act (Occupational Health and Safety Act, Act 85 of 1993) (Reporting to DOL (Department of Labour) Inspector regarding certain incidents).

All lost time incidents associated with the contract works or reportable as defined by **Section 24** of the OHS Act shall be immediately reported to the Client.

The Principal Contractor / Sub-Contractor shall provide a detailed report of all accidents / incidents, including events that could have become lost time incidents were it not for fortuitous circumstances to the Client within 5 days of the incident occurring. The Principal Contractor / Sub-Contractor shall provide copies of all reports and information associated with the incidents to the Client. Copies of reports must be placed on the Health and Safety File.

Where the Principal Contractor / Sub-Contractor has been:

- Served with a prohibition, contravention or improvement notice under the OHS Act; or
- Required to comply with any order issued by an inspector for the Department of Labour;
- The Principal Contractor / Sub-Contractor shall immediately supply a copy of that notice, order or notification to the Client.
- Where the Principal Contractor / Sub-Contractor have been served with a summons or is convicted of any offence in relation to occupational health and safety, the Principal Contractor / Sub Contractor shall immediately supply a copy of that summons to the Client.
- The Principal Contractor / Sub-Contractor shall detail the reporting and investigation procedures for incident investigation. The procedures shall include the investigating officer responsible and the time limits imposed for reporting and investigating the incident and to implement corrective action in a timely manner so as to prevent a recurrence.
- The client may participate in or undertake an investigation into the incident, injury or illness at its discretion and the Principal Contractor / Sub-Contractor shall cooperate with and provide assistance to the investigation organized and undertaken by the Client.

#### **C3.7.4.5 First Aid**

- Establish and implement a first-aid programme to provide emergency treatment to victims of accidents, chemical substances or excessive exposure to toxic substances.

The programme shall include:

- proper first aid facilities administered by qualified personnel,
- first-aid boxes,
- first-aid room, where there are 500 or more workers on site,
- training and re-training of first-aiders,
- first-aid treatment procedures,
- standard procedures,
- special procedures, e.g. for poisoning,
- maintenance of first-aid facilities
- All first-aid provisions shall comply with the OHS Act (Act 85 of 1993)

#### **C3.7.4.6 Fire protection and prevention**

- Appropriate measures must be taken to avoid the risk of fire.
- Sufficient and suitable storage must be provided for flammable liquids, solids and gases.



- Smoking must be prohibited and notices in this regard must be prominently displayed in all places containing readily combustible or flammable materials;
- Combustible materials must not accumulate on the construction site.
- Welding, flame cutting and other hot work may only be done after the appropriate precautions have been taken to reduce the risk of fire.
- Suitable and sufficient fire-extinguishing equipment must be placed at strategic locations and such equipment must be maintained in good working order.
- A sufficient number of workers must be trained in the use of fire-extinguishing equipment.

#### **C3.7.4.7 Site Emergency Procedures**

The Principal Contractor / Sub-Contractor shall establish an Emergency Evacuation and Rescue plan.

The plan shall include the following detail:

- The role and responsibility of every individual in the work area on fire safety emergency evacuation and rescue;
- General work area precautions, fire prevention, detection, protection and warning alarm systems;
- Firefighting and rescue equipment including types of fire extinguishers;
- Fire safety measures for Site accommodation;
- Escape and communication;
- Fire brigade access, facilities and coordination;
- Fire drills and training including the use of fire-fighting equipment;
- Material storage including flammable liquids, gasses and waste;

The Principal Contractor / Sub-Contractor shall ensure that all procedures, precautionary measures and safety standards stipulated in the Plan are communicated, implemented and complied with by all workers including other interfacing contractors on Site.

The Principal Contractor / Sub-Contractor shall practice their emergency preparedness within six (6) weeks of the commencement of work and at least four (4) monthly intervals thereafter.

The Principal Contractor / Sub-Contractor shall review and ensure the adequacy of the Plan as the work progress.

The Principal Contractor / Sub-Contractor shall conduct monthly checks on fire-fighting equipment and test alarms and detection devices installed on Site and document findings in a register which shall be on site at all times for inspection.

The Principal Contractor / Sub-Contractor shall conduct weekly inspections of escape routes, fire brigade access, fire-fighting facilities and working areas to ensure that the requirements stipulated in the Fire Safety, Emergency, Evacuation and Rescue Plan are complied with. All inspection records shall be documented in registers and kept in the Health and Safety file for inspection at any time.

#### **C3.7.4.8 Housekeeping**

Suitable housekeeping must continuously be implemented on the construction site, including:

- proper storage of materials and equipment
- removal of scrap, waste and debris at appropriate intervals;

Loose materials shall not be placed or allowed to accumulate on the site so as to obstruct access and egress from workplaces and passageways.

#### **C3.7.4.9 Stacking & Storage**

- Adequate storage areas are must be provided.
- Storage areas must be kept neat and under control.

#### **C3.7.4.10 Illumination**

Provide adequate artificial lighting when work is carried out after dark or inside buildings.

#### **C3.7.4.11 Sanitation / Hygiene**

Provision of site hygiene facilities:

- One sanitary facility for every 30 workers.
- Adequate washing facilities.
- One shower facility for every 15 workers;

Drying sheds, huts, rooms or other accommodation for sheltering during bad weather, storing clothes and taking meals. Facilities should include tables and chairs, suitable means for boiling water and a supply of wholesome drinking water.

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

#### **C3.7.4.12 Personal Protective Equipment**

The Principal Contractor / Sub-Contractor shall provide and maintain suitable PPE (Personal Protective Equipment) for all employees employed on the Site.

The Principal Contractor / Sub-Contractor shall ensure that such PPE comply with the requirements of the OHS Act (Occupational Health and Safety Act, Act 85 of 1993).

The Principal Contractor / Sub-Contractor shall also ensure that all equipment is properly used by his / her employees during the course of their work.

The Principal Contractor / Sub-Contractor shall record all issues of all equipment to his / her employees in documented registers and such registers shall be kept in the Health and Safety File on site and made available for inspection at all times.

The Principal Contractor / Sub-Contractor shall provide the Client / Client's Agent with a colour code by which employees will be identified with regard to occupations, responsibilities, accountabilities, reporting relationships and access to different locations on site. (e.g. hard hats, overalls).

PPE shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards.

All personal protective equipment shall be of safe design and construction for the work to be performed.

#### **C3.7.4.13 Permit to Work Requirements**

Institute a "hot work" permit system in respect of:

- metalwork flame cutting,
- site welding,

#### **C3.7.4.14 Lock-Out**

Institute a "Lock-out" procedure in respect of controlling energy so as to prevent unexpected operation or activation of machinery or equipment. This procedure must include a written policy, specific procedures, rules and supervisory follow-up, covering the positive locking of switches and valves to ensure that alterations, maintenance, set-up and or other work can be performed safely.

#### **C3.7.4.15 Monthly Health and Safety Audits**

The Principal Contractor shall carry out monthly Health and Safety Audits on the measures contained within his / her Health and Safety Plan submitted to the Client as well as Health and Safety Plans submitted by Sub-Contractors appointed by the Principal Contractor to demonstrate that the required level of health and safety are being achieved and maintained and compile a full report to the Client on such audit.

The Client will audit the Principal Contractor as well as his / her Sub-contractor's Health and Safety Plans from time to time and will advise the Principal Contractor of any matter with which he / she is not satisfied and the Principal Contractor shall take such steps as are necessary to satisfy the Client.

The Client will carry out such audits as he / she considers necessary but not less than monthly.

The Principal Contractor shall make available, specialist personnel as the Client may consider necessary for the performance of such audits.

The Principal Contractor shall develop and maintain an Audit Schedule that details the audits planned to be undertaken by the Principal Contractor of the work under the contract, including sub-contractors, for the duration of the contract. The Audit Schedule shall form part of the Health and Safety Plan that needs to be submitted by the Principal Contractor.

Audit reports shall detail the scope of the audit, the audit questions and the audit findings.

The Client shall be promptly provided with copies of all audit reports together with other documentation to show that all matters raised have been appropriately addressed.

Unless otherwise directed by the Client the Principal Contractor / Sub-Contractor shall undertake its initial OHS Audit within 4 weeks of commencement of work. The Principal Contractor / Sub-Contractor shall undertake subsequent OHS Audits at a frequency not less than once every 3 months.

All Principal Contractor's OHS Audits shall include an assessment of Sub-Contractor compliance with the approved OHS Plan.

#### **C3.7.4.16 Management Review**

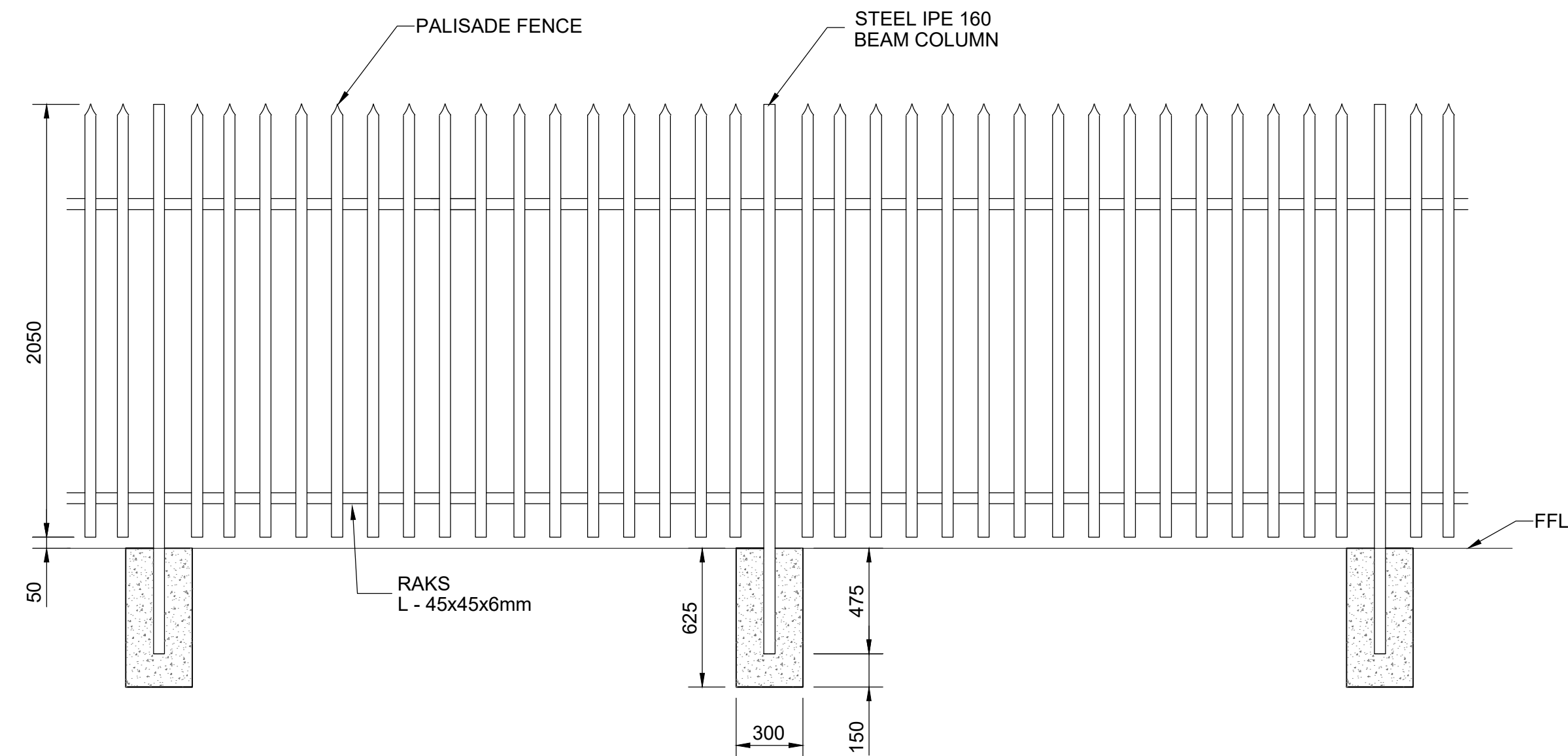
The Principal Contractor shall undertake an independent review of the Health and Safety Plan for the contract in accordance with the requirements of the OHS Act, relevant Regulations and in particular the Construction Regulations 2003.

A review shall be undertaken 3 months after commencement of the contract and every 6 months thereafter for the duration of the contract.

Following the completion of the review, the Principal Contractor shall submit a written report that details the suitability, adequacy and effectiveness of the OHS Plan and to certify that the Site procedures, practices and operations are in accordance with the contract.

#### **C3.7.4.17 Provision of Information**

- Provide Sub-Contractors appointed by him / her with the relevant sections of the Health and Safety specifications pertaining to the construction work which has to be performed.



LOCKABLE GATE

5000

LOCKABLE PEDESTRIAN GATE

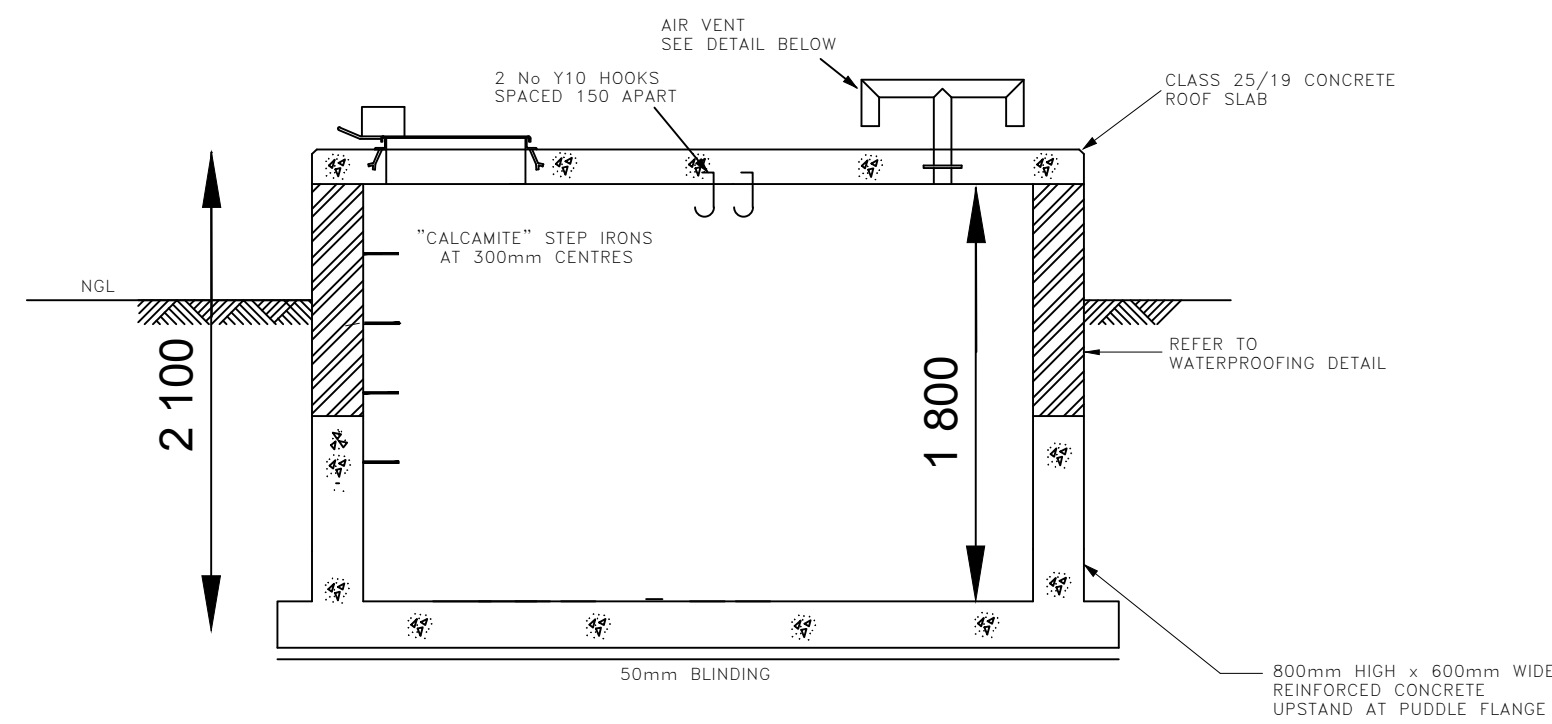
TO SUIT FENCE HEIGHT

Technical drawing of a cable assembly. The drawing shows a cable with a braid and insulation, connected to a rectangular component on the left and a multi-pin connector on the right. Dimensions are indicated: 12 140 (total length), 250 (distance from left end to first connector), and 5120 (distance between the two connectors).

1. CONTRACTOR TO PROVIDE FINAL FABRICATION DRAWING FOR APPROVAL BY ENGINEER.

[illegible]





20mm x 20mm CHAMFER  
ON ALL EXPOSED EDGES

"CALCAMITE" STEP IRONS  
AT 300mm CENTRES

50mm BLINDING

200mm THICK CLASS 25/19  
CONCRETE FLOOR

NGL

The diagram illustrates a cross-section of a window frame assembly. At the base is a 200mm thick concrete floor (Class 25/19). Above this is a 50mm thick blinding layer. The window frame is supported by "CALCAMITE" step irons at 300mm centres. The frame has a 20mm x 20mm chamfer on all exposed edges. The assembly is shown relative to the Natural Ground Level (NGL).

2 200

1 200

CONCRETE BASE

AIR VENT  
SEE DETAIL BELOW

600 x 800 HIGH  
REINFORCED CONCRETE  
UPSTAND AT PUDDLE FLANGE

1 000

CONCRETE BASE

PLAN ON ROOF

2 000

2 000

1 200

CONCRETE BASE

600 x 800 HIGH REINFORCED CONCRETE UPSTAND AT PUDDLE FLANGE

STEP IRONS AT 305mm CENTRES

CONCRETE BASE

PLAN ON PIPEWORK

76mm HOLLOW SECTION  
3mm THICK

GALVANISED INSECT SCREEN  
WELDED TO PIPE END  
(SEE DETAIL)

10mm THICK PUDDLE

10mm THICK FLANGE

GALVANISED INSECT SCREEN  
WELDED TO PIPE END  
(SEE DETAIL)

Diagram of a circular plate with 48 holes. The holes are arranged in a grid pattern. A label points to the holes: "38 No. 48 HOLES DRILLED IN 75# GALVANISED PLATE 3 THICK".

12mm 1:5 PLASTER WITH "SICALITE  
ADD MIXTURE"

NGL

"CEMFLEX"  
WATERPROOFING

SIKAFLEX PRO 2HP

PIPE

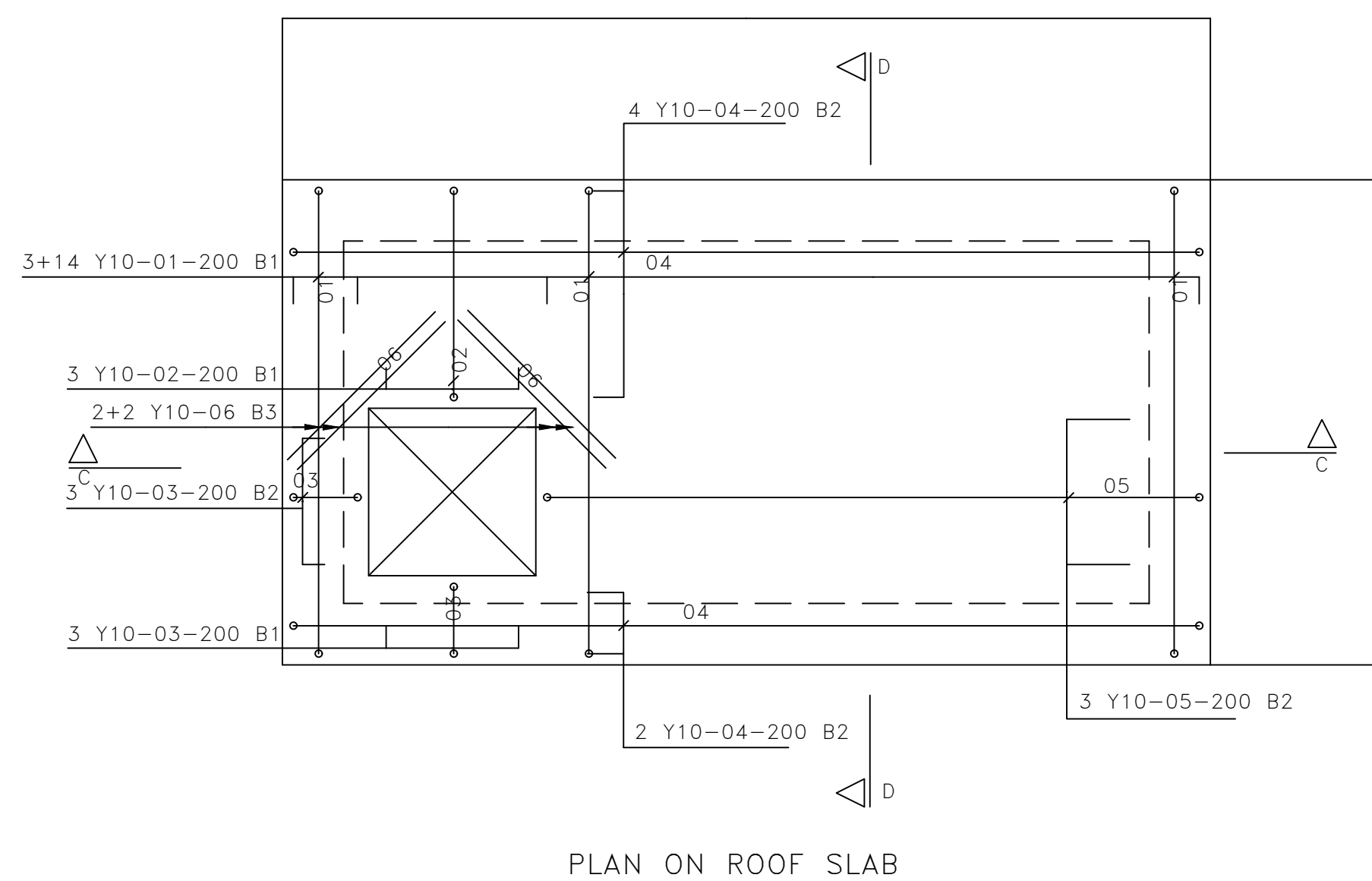
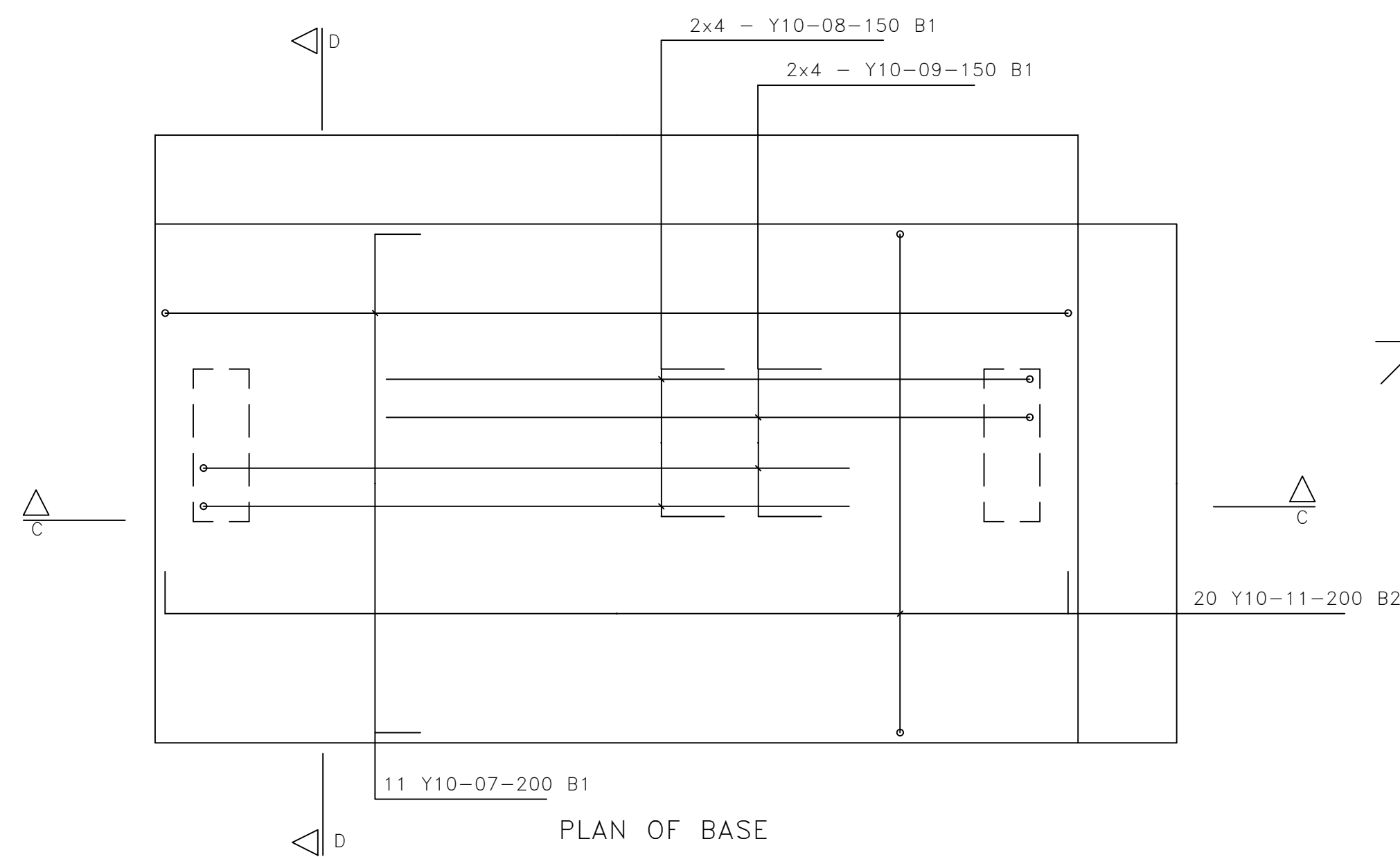
ALL BURIED PIPES AND FLANGES TO BE  
WRAPPED IN "DENSO MASTIC BLANKET" TAPE.

NOTE:  
ALL PRODUCTS APPLIED IN ACCORDANCE WITH  
MANUFACTURER'S INSTRUCTIONS

1. ALL STRUCTURAL CONCRETE 25/19 MPa.
2. PROVIDE 20x20 CHAMFERS ON ALL EXPOSED EDGES.
3. COVER TO REINFORCEMENT 40mm.
4. A MINIMUM CLEAR DISTANCE OF 50mm IS REQUIRED BETWEEN PUDDLE FLANGE AND REINFORCING STEEL.
5. WRAP 2 LAYERS THREE PLY MALTHOID AROUND STEEL PIPE AT CONCRETE OR BRICK INTERFACES EXCEPT PUDDLE PIPES.
6. REFER DRAWING 2099-005-C-02-WMC REINF FOR REINFORCEMENT DETAILS.

[illegible]



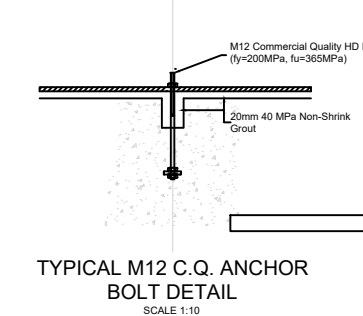
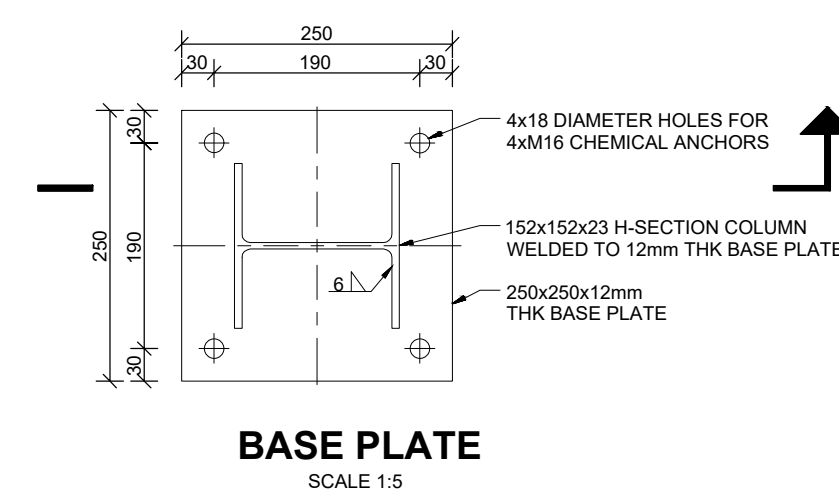
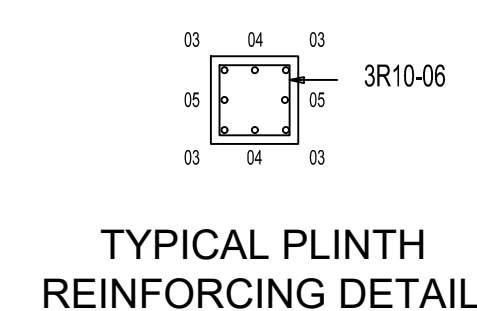
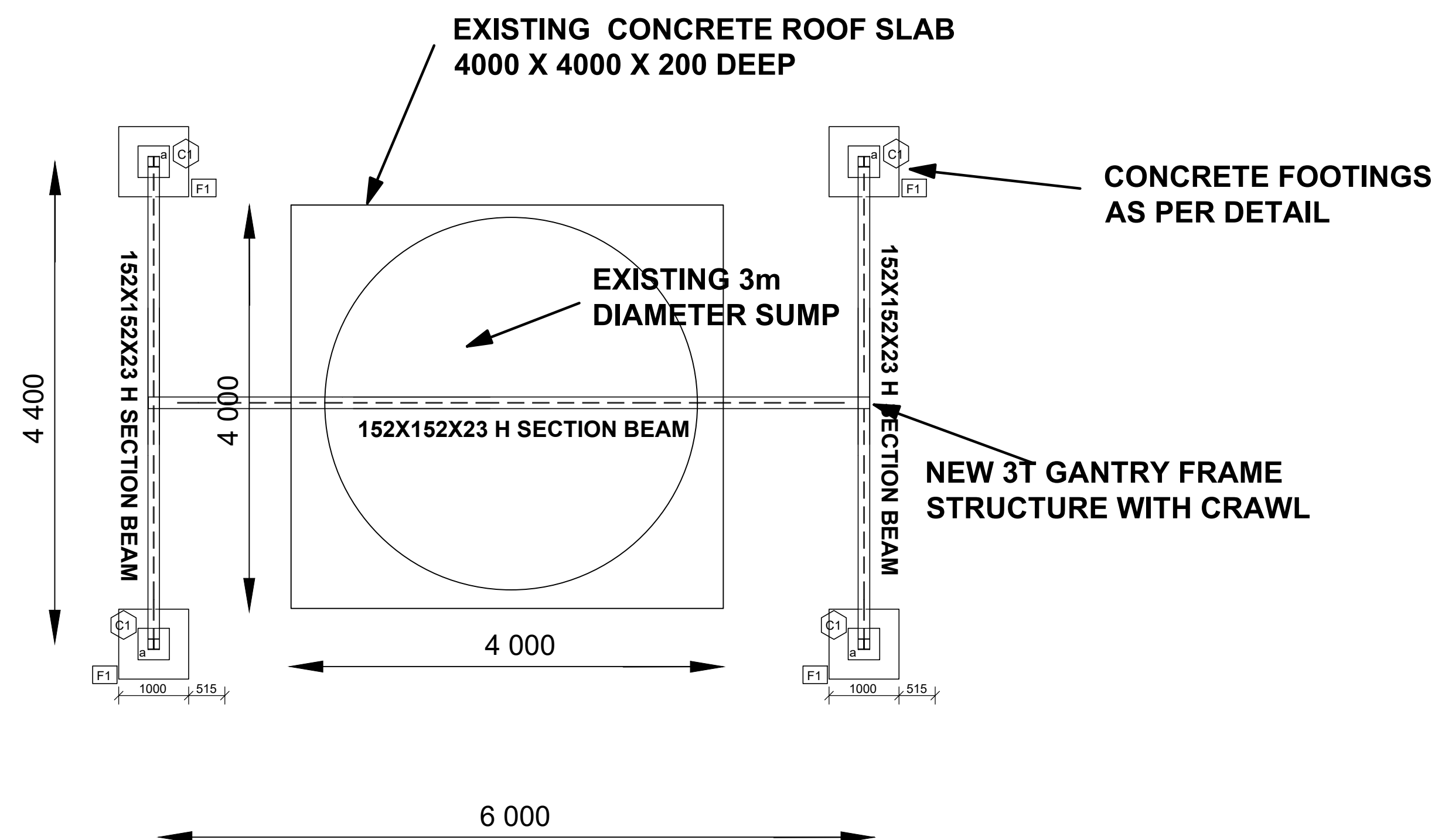
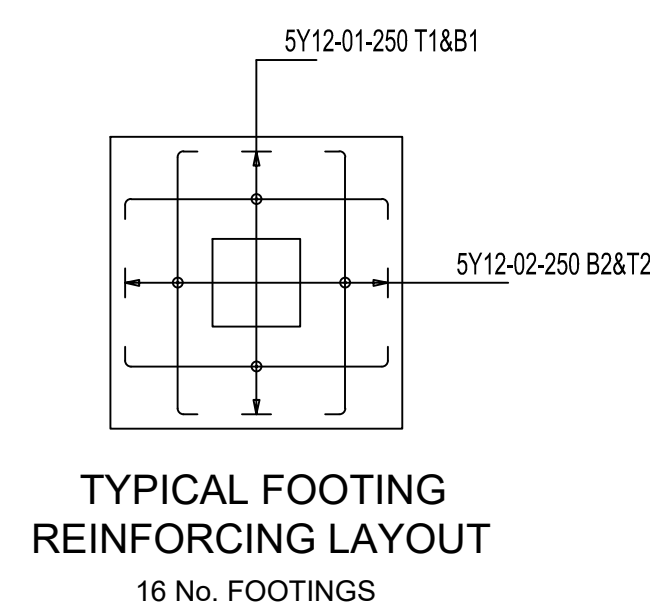
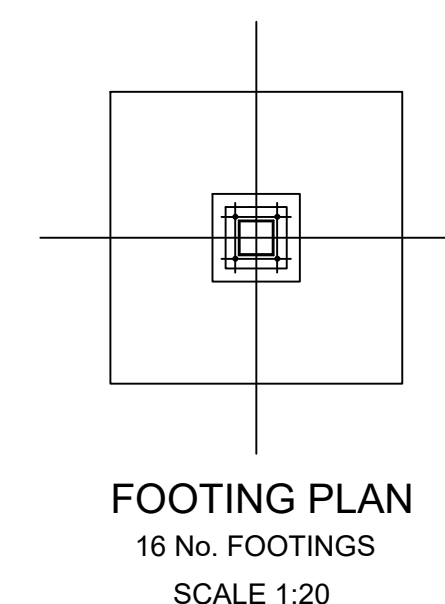
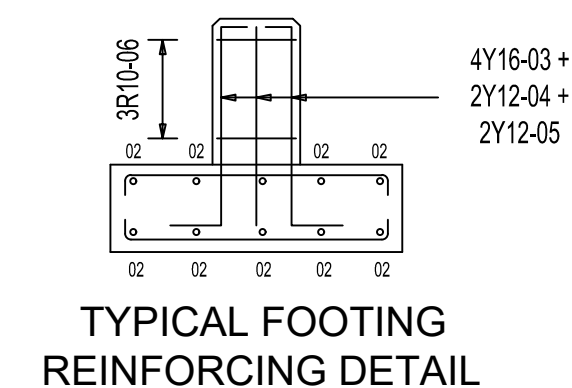
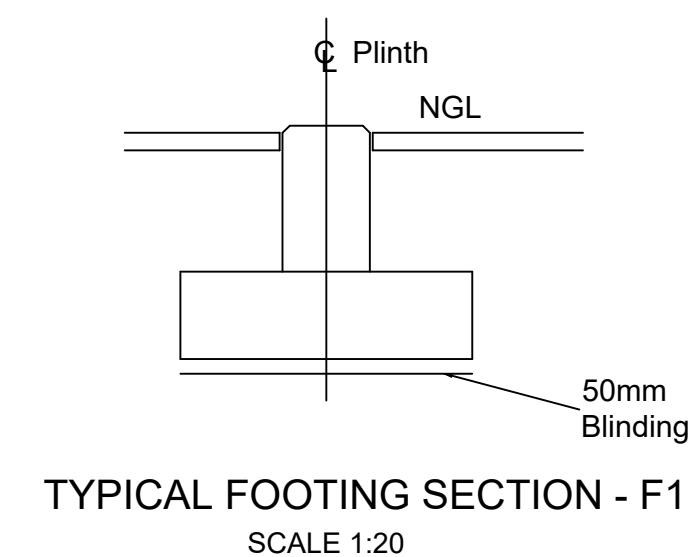
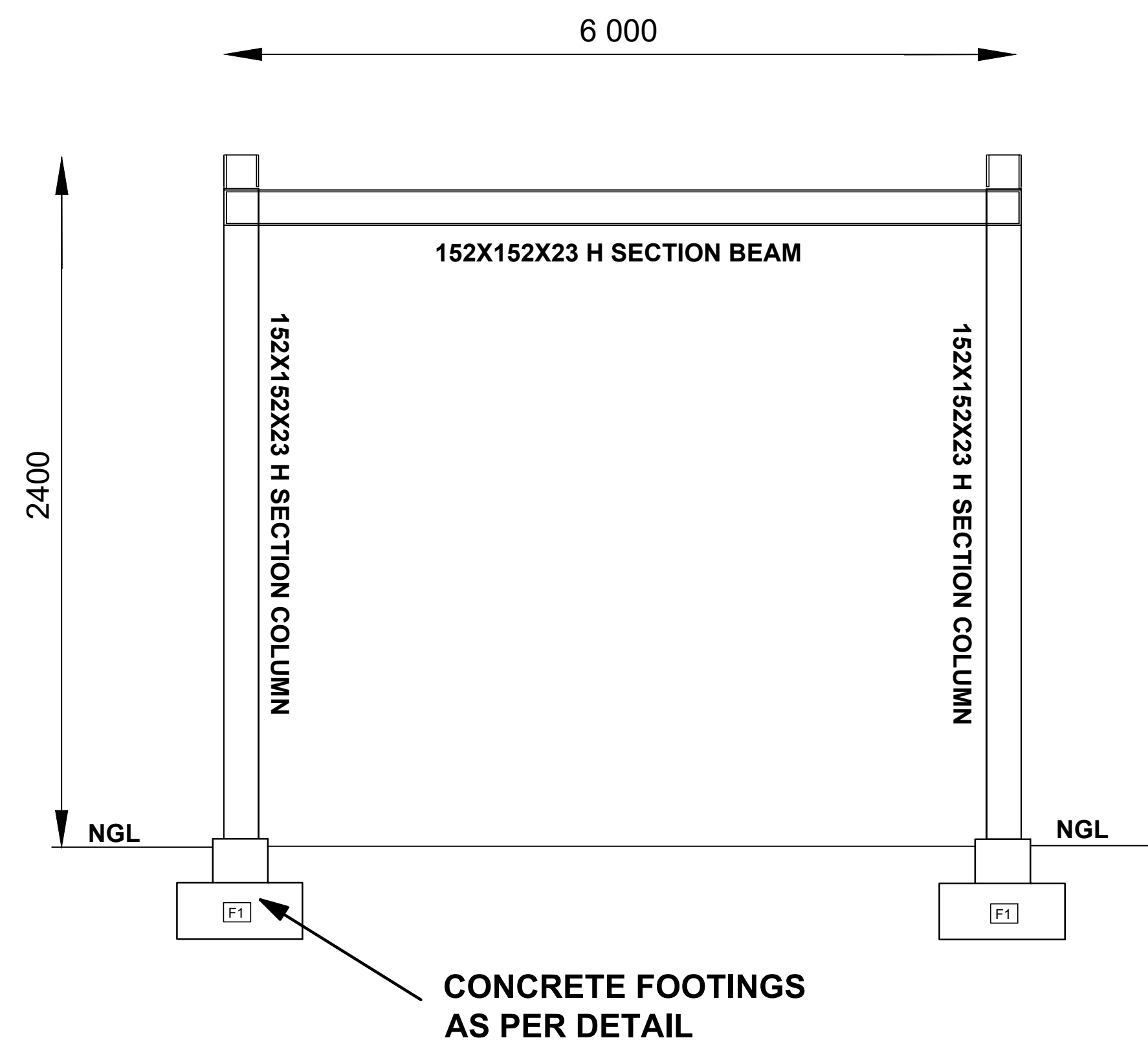


| BAR TYPE | BAR MARK | No. OF MEMBERS | No. IN EACH | TOTAL NUMBER | TOTAL LENGTH OF EACH BAR(mm) | TOTAL MASS (kg) | SHAPE CODE | A    | B   | C |
|----------|----------|----------------|-------------|--------------|------------------------------|-----------------|------------|------|-----|---|
| Y10      | 01       | 1              | 17          | 17           | 1900                         | 20.00           | 35         | 1660 |     |   |
| Y10      | 02       | 1              | 3           | 3            | 1000                         | 1.85            | 35         | 740  |     |   |
| Y10      | 03       | 1              | 6           | 6            | 500                          | 1.85            | 35         | 240  |     |   |
| Y10      | 04       | 1              | 6           | 6            | 3500                         | 12.96           | 35         | 3250 |     |   |
| Y10      | 05       | 1              | 3           | 3            | 2550                         | 4.72            | 35         | 2300 |     |   |
| Y10      | 06       | 1              | 4           | 4            | 750                          | 1.85            | 20         | 750  |     |   |
| Y10      | 07       | 1              | 11          | 11           | 3800                         | 25.79           | 35         | 3550 |     |   |
| Y10      | 08       | 2              | 4           | 8            | 2850                         | 14.07           | 54         | 140  | 900 |   |
| Y10      | 09       | 2              | 4           | 8            | 3750                         | 18.51           | 38         | 140  | 900 |   |
| Y10      | 10       | 2              | 10          | 20           | 500                          | 6.17            | 20         | 500  |     |   |
| Y10      | 11       | 1              | 20          | 20           | 2250                         | 27.77           | 35         | 1960 |     |   |
| TOTAL    |          |                |             |              |                              | 135.54          |            |      |     |   |

ISSUED FOR TENDER

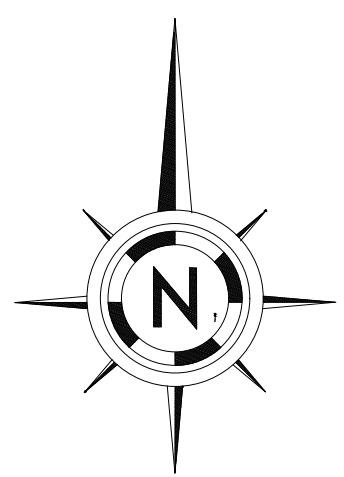
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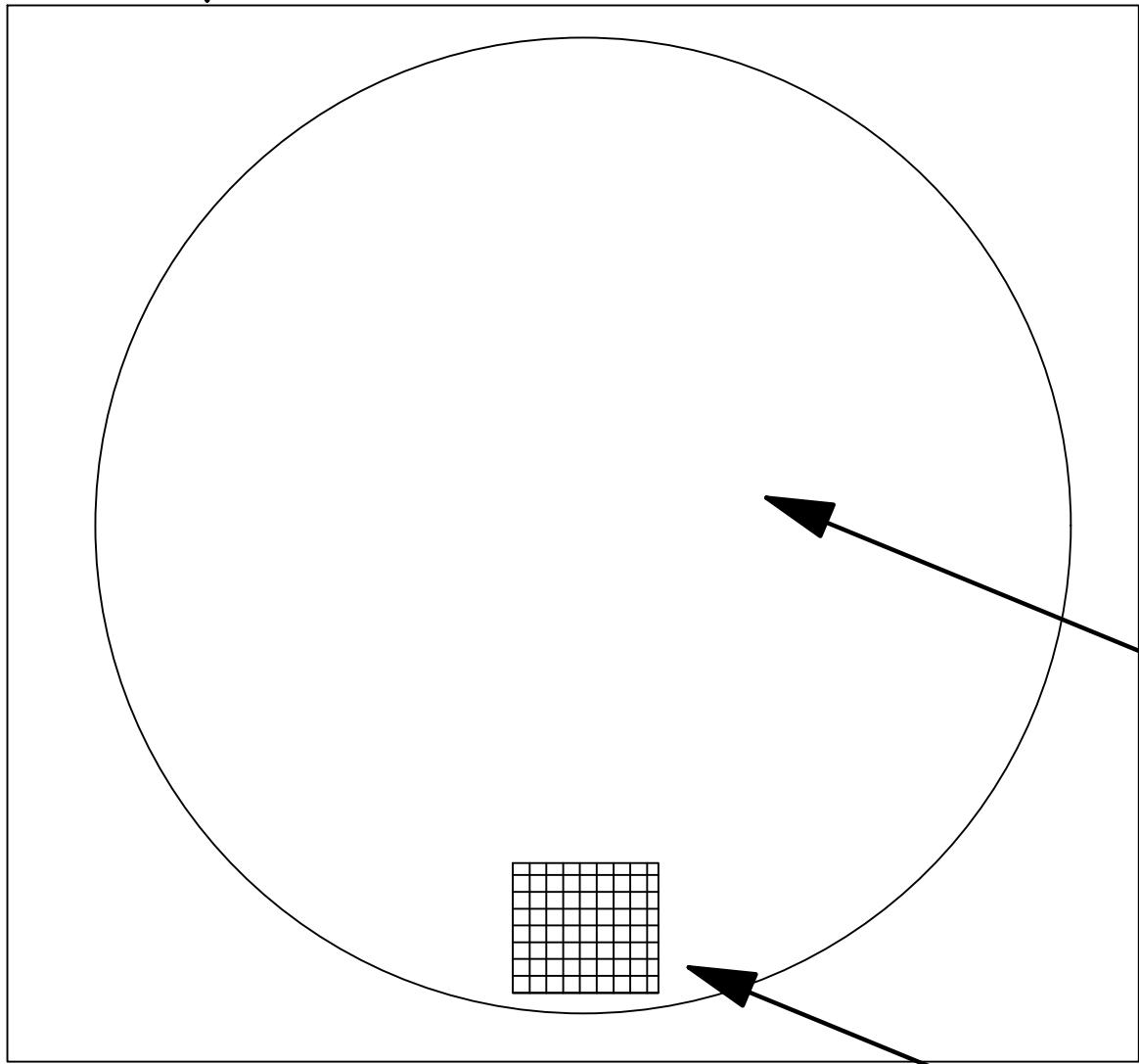


|     |      |     |     |             |              |                                                                                       |                                                                                       |                                                                                                                                                             |               |      |                      |                                  |       |                                                       |                                                                                                                                |  |
|-----|------|-----|-----|-------------|--------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------|----------------------|----------------------------------|-------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--|
|     |      |     |     |             |              | CLIENT                                                                                | MUTEO CONSULTING                                                                      | 39 GROBLER STREET<br>POLOKWANE 0699<br>P.O. BOX 6196<br>POLOKWANE NORTH<br>0750<br>TEL : (015) 291 4065<br>FAX : (015) 291 4043<br>website: www.muteo.co.za | PROJECT APPR. | DATE | BY                   | SIGNATURE                        | SCALE | ALL DIMENSION IN mm UNLESS SPECIFIED OTHERWISE        |                                                                                                                                |  |
|     |      |     |     |             |              |  |  | DESIGNED                                                                                                                                                    | 10 OCT 2025   | S.D  |                      | DO NOT SCALE<br>IF IN DOUBT ASK. |       | TITLE                                                 | RETROFITTING OF 7 SEWER PUMP STATIONS,<br>INSTALLATION OF INLINE GRINDERS AND REPAIRS TO<br>WWTW PLANT IN HOOPSTAD AND TIKWANA |  |
|     |      |     |     |             | CHECKED      |                                                                                       |                                                                                       | 10 OCT 2025                                                                                                                                                 | N.M           |      | PROJECT No.          |                                  |       |                                                       |                                                                                                                                |  |
|     |      |     |     |             | DRAWN        |                                                                                       |                                                                                       | 10 OCT 2025                                                                                                                                                 | S.D           |      | FWPQ 27 OF 2022-2026 |                                  |       | GANTRY STRUCTURAL LAYOUT & DETAILS                    |                                                                                                                                |  |
|     |      |     |     |             | PROJECT MNG. |                                                                                       |                                                                                       |                                                                                                                                                             |               |      | DRG SIZE             |                                  | A1    | DRAWING No.<br>FWPQ 27 OF 2022-26/CIVIL/STRUCTURAL/01 | REV<br>0                                                                                                                       |  |
| REV | DATE | CHK | APP | DESCRIPTION |              |                                                                                       |                                                                                       |                                                                                                                                                             | APPROVED      |      |                      |                                  |       |                                                       |                                                                                                                                |  |





EXISTING CONCRETE ROOF SLAB  
4000 X 4000 X 200 DEEP



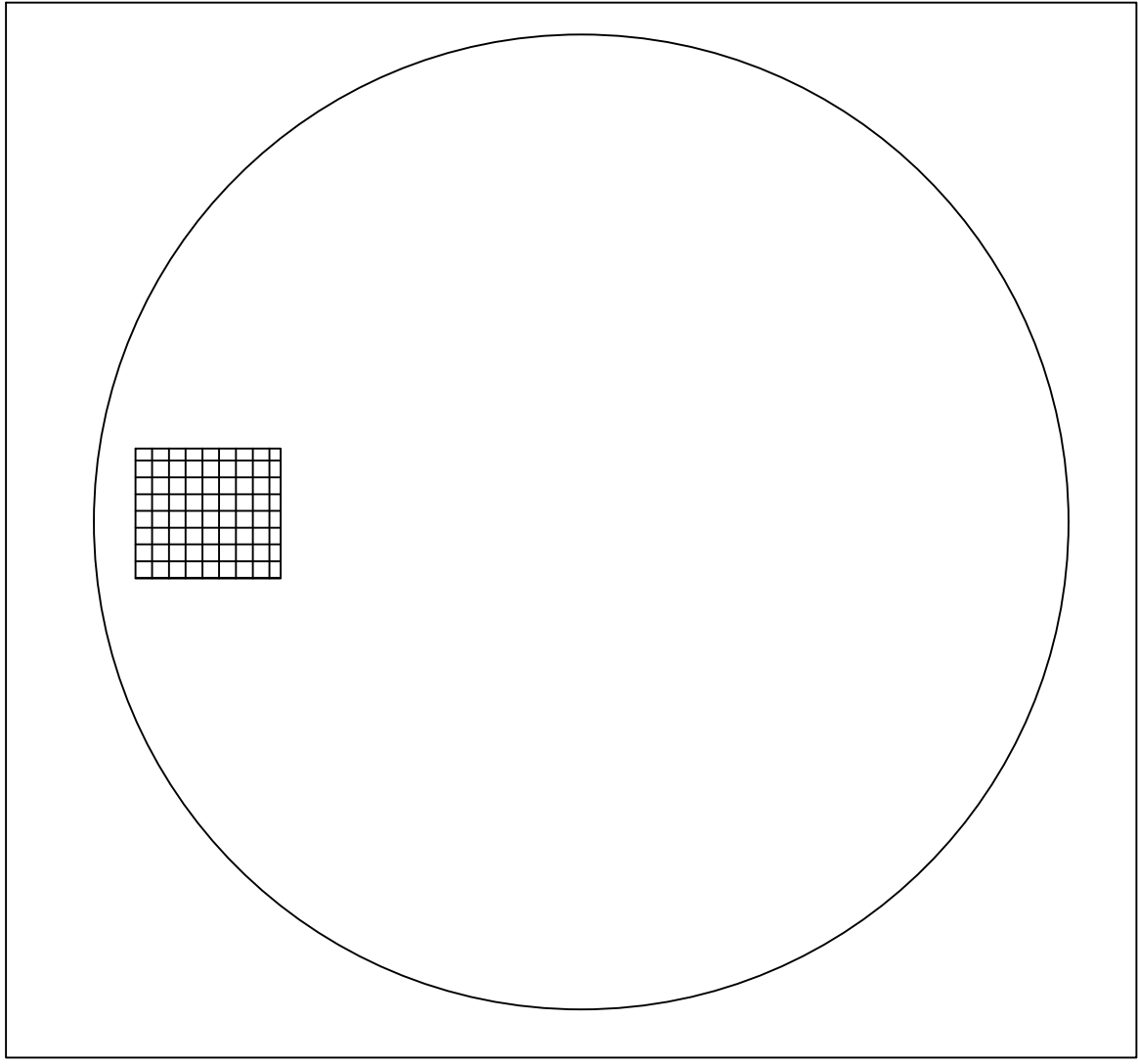
EXISTING 3m  
DIAMETER SUMP

4 000

OPENING

4 000

RE-ARRANGE ROOF SLAB  
BY RORATING TO SUIT  
SITE REQUIREMENTS



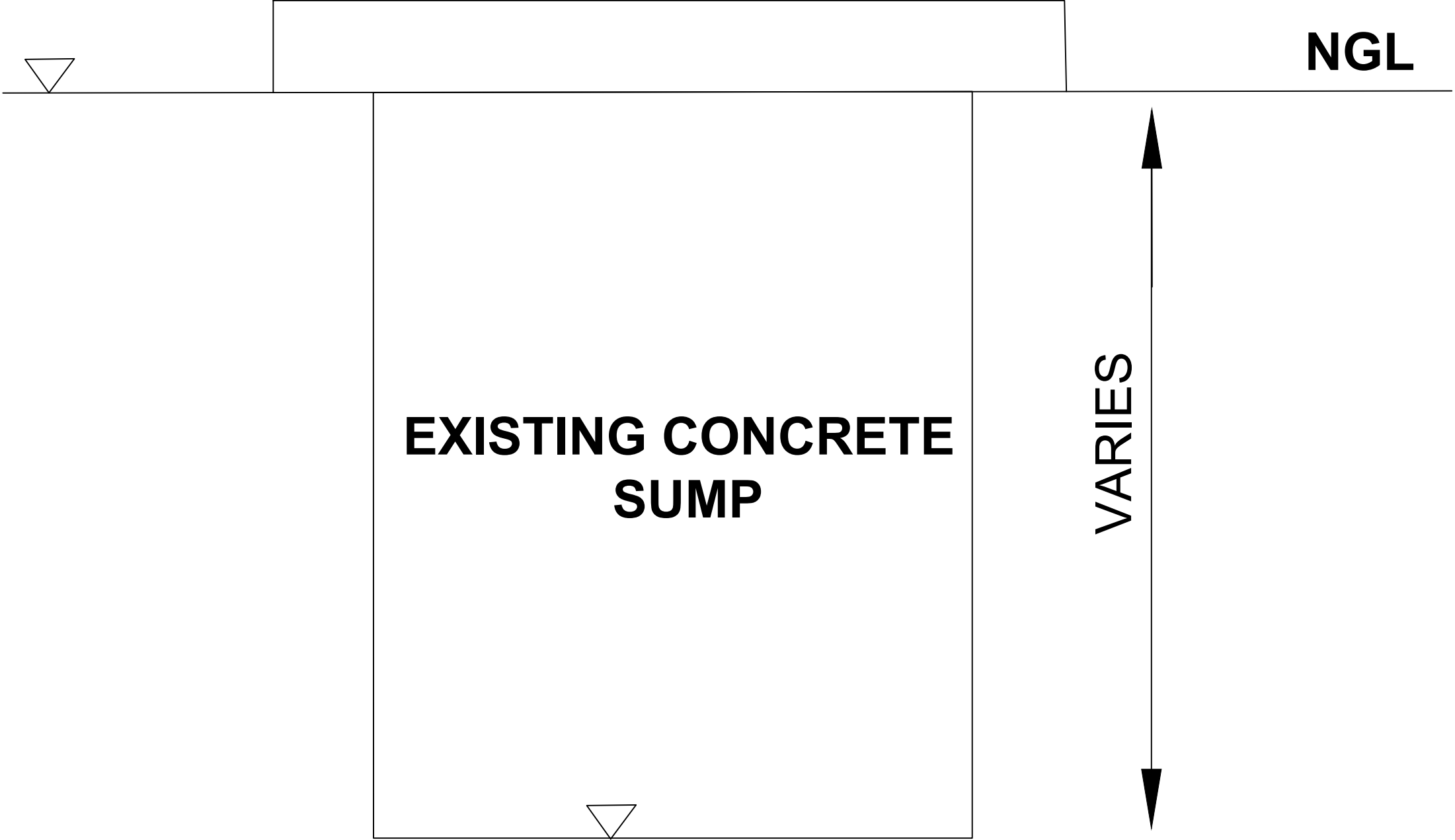
ROTATED SLAB

4 000

4 000

EXISTING CONCRETE ROOF SLAB  
4000 X 4000 X 200 DEEP

4 000



NGL

VARIES

3 000

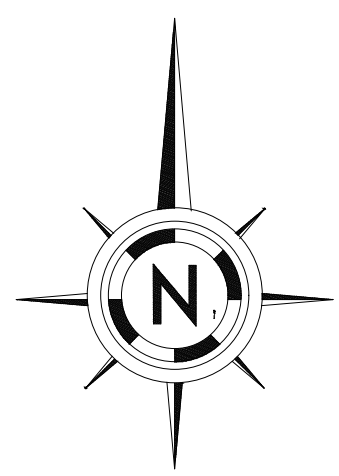
EXISTING CONCRETE  
SUMP

NOTE - CONTRACTOR TO SAFELY LIFT  
8T SLAB AND PUT IN SPECIFIED ANGLE

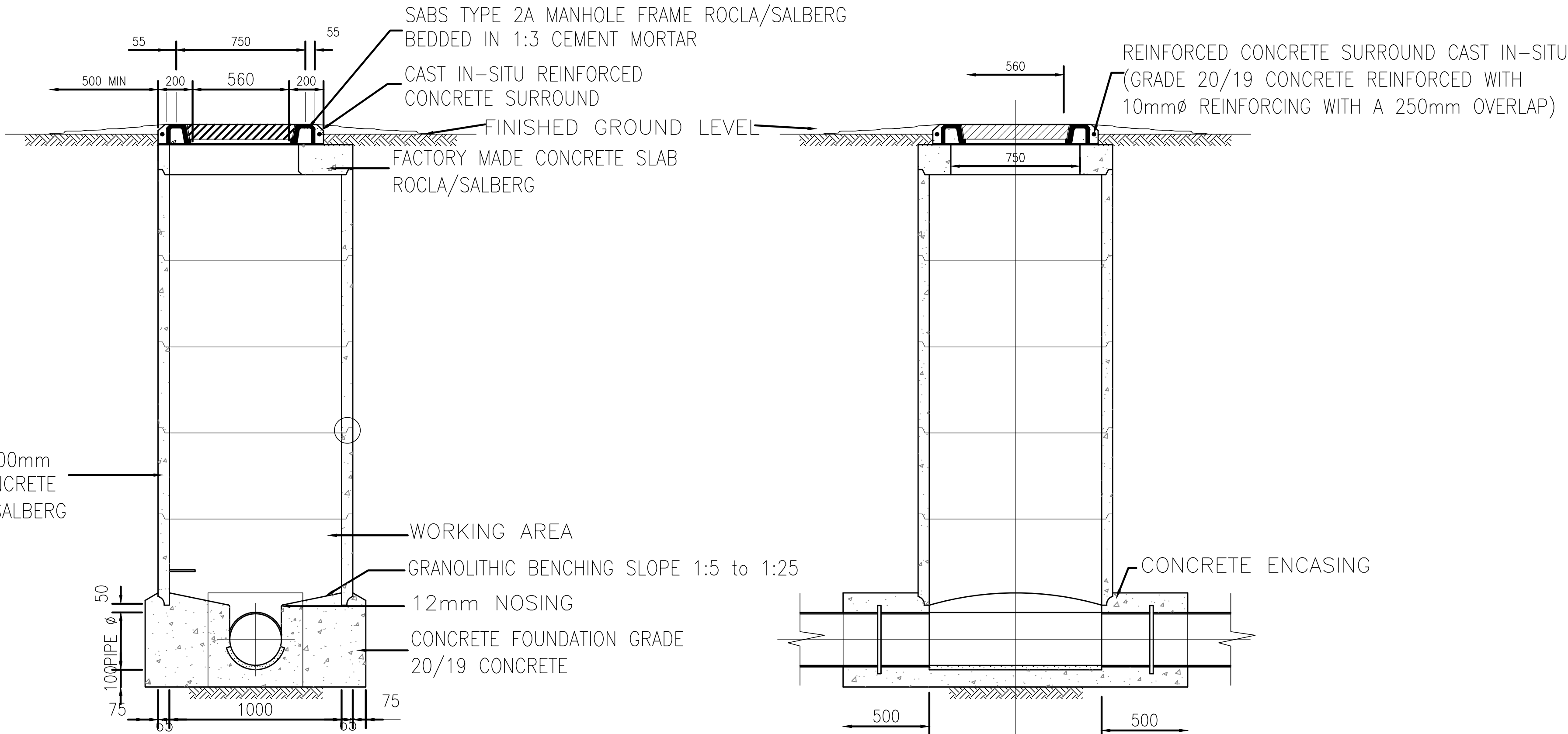
ISSUED FOR TENDER

|     |      |     |     |             |  |  |  |        |                  |                                                                                                                                                             |                                                                                     |                                                   |                         |           |                                                                                                    |                                                                                                                                                                                                                                                                                           |          |
|-----|------|-----|-----|-------------|--|--|--|--------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------|-----------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|     |      |     |     |             |  |  |  | CLIENT | MUTEO CONSULTING | 39 GROBLER STREET<br>POLOKWANE 0699<br>P.O. BOX 6196<br>POLOKWANE NORTH<br>0750<br>TEL : (015) 291 4065<br>FAX : (015) 291 4043<br>website: www.muteo.co.za | PROJECT APPR.<br>DESIGNED<br>CHECKED<br>DRAWN<br>PROJECT MNG.<br>APPROVED<br>CLIENT | DATE<br>10 OCT 2025<br>10 OCT 2025<br>10 OCT 2025 | BY<br>S.D<br>N.M<br>S.D | SIGNATURE | SCALE<br>DO NOT SCALE<br>IF IN DOUBT ASK.<br>PROJECT No.<br>FWPQ 27 OF 2022-2026<br>DRG SIZE<br>A1 | ALL DIMENSION IN mm UNLESS SPECIFIED OTHERWISE<br>TITLE<br>RETROFITTING OF 7 SEWER PUMP STATIONS,<br>INSTALLATION OF INLINE GRINDERS AND REPAIRS TO<br>WWTW PLANT IN HOOPSTAD AND TIKWANA<br>PUMPSTATIONS ROOF SLAB RE-ALIGNMENT<br>DRAWING No.<br>FWPQ 27 OF 2022-26/CIVIL/STRUCTURAL/02 | REV<br>0 |
| REV | DATE | CHK | APP | DESCRIPTION |  |  |  |        |                  |                                                                                                                                                             |                                                                                     |                                                   |                         |           |                                                                                                    |                                                                                                                                                                                                                                                                                           |          |



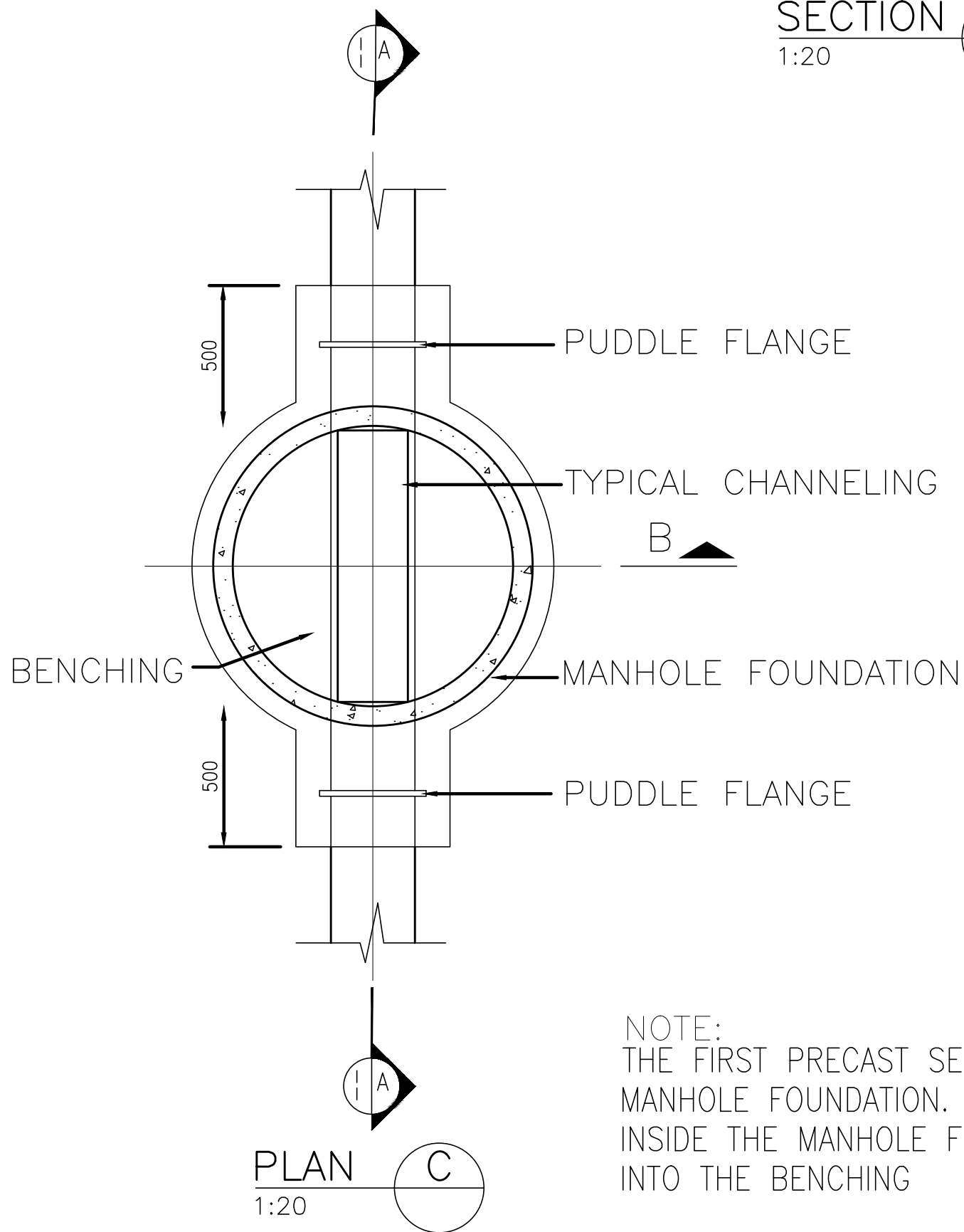


250mm AND/OR 500mm  
FACTORY MADE CONCRETE  
SECTIONS. ROCLA/SALBERG  
TYPE



SECTION B  
1:20

SECTION A  
1:20



PLAN C  
1:20

NOTE:  
THE FIRST PRECAST SECTION MUST BE BEDDED INTO THE  
MANHOLE FOUNDATION. ENOUGH SPACE MUST BE LEFT  
INSIDE THE MANHOLE FOR THE CHANNELS TO BE BEDDED  
INTO THE BENCHING

NOTES :

BACK FILLING OF TRENCH EXCAVATIONS

1. SELECTED BACK FILL CLASS I – IMPLIES APPROVED SELECTED MATERIAL FROM TRENCH EXCAVATION, FREE FROM STONES AND WITH A OPTIMUM MOISTURE CONTENT.
2. SELECTED BACK FILL CLASS II – IMPLIES SELECTED BACK FILL FROM THE TRENCH EXCAVATION, WHICH SHALL NOT CONTAIN ANY STONES LARGER THAN 150mm Ø.
3. CLASS "A" BEDDING/ ENCASING CONCRETE BETWEEN JOINTS SHALL BE CARRIED OUT IN ONE CONTINUOUS OPERATION USING CLASS 20/19 CONCRETE.
4. FLEXIBLE JOINTS MUST BE PROVIDED, AT EACH PIPE JOINT IN A CLASS "A" CONCRETE BEDDING/ENCASING, WITH A 12mm THICK SOFT BOARD PLACED VERTICALLY FOR THE ENTIRE CONCRETE AREA. PIPE JOINTS MUST BE SEALED WITH WET CLAY TO PREVENT SLUSH FROM PENETRATING THE JOINT.
5. EXCEPT FOR THE 300mm BACK FILL ON TOP OF THE PIPE THE BALANCE OF THE TRENCH MAY BE BACK FILLED WHEN THE CLASS "A" BEDDING/ENCASING HAS OBTAINED A COMPRESSIVE STRENGTH OF 15 MPa.
6. APPROVED SELECTED GRAVEL MATERIAL WITH A PI NOT EXCEEDING 6, FREE FROM STONES EXCEEDING 20mm, ORGANIC MATTER AND LUMPS OF CLAY.

ISSUED FOR TENDER

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2. LINING IS A SOLVENT FREE EPOXY WITH A MINIMUM THICKNESS OF 600MICRONS

| Description                                                         |
|---------------------------------------------------------------------|
| <p align="center"><b>SEWER PUMP STATION 1<br/>DETAIL LAYOUT</b></p> |

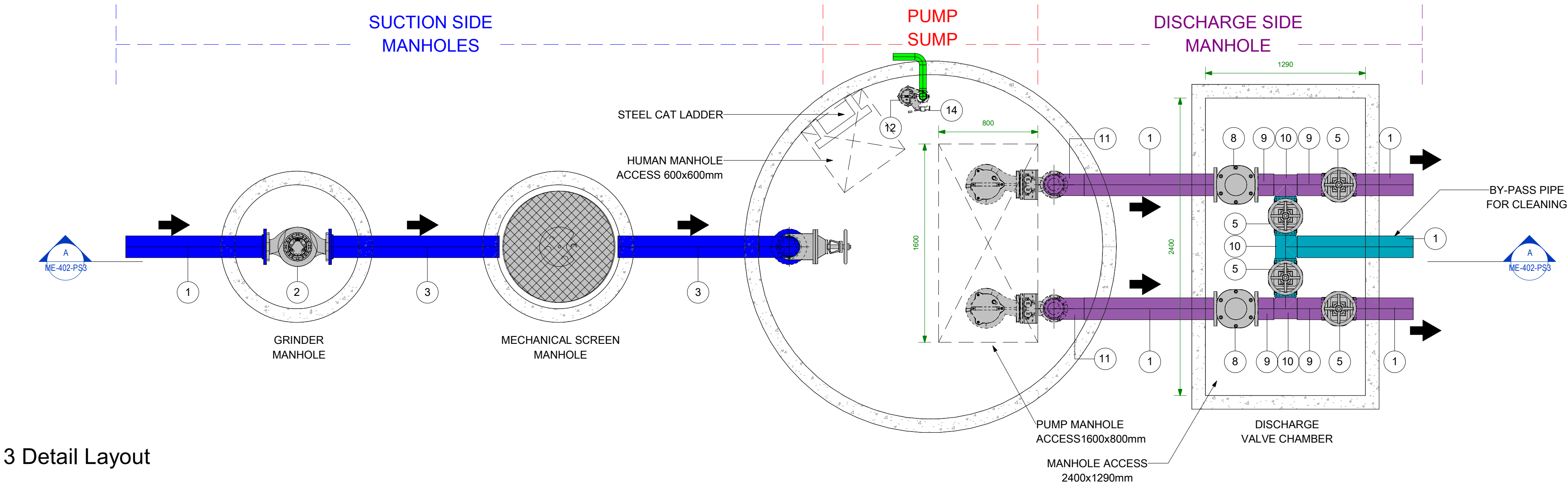






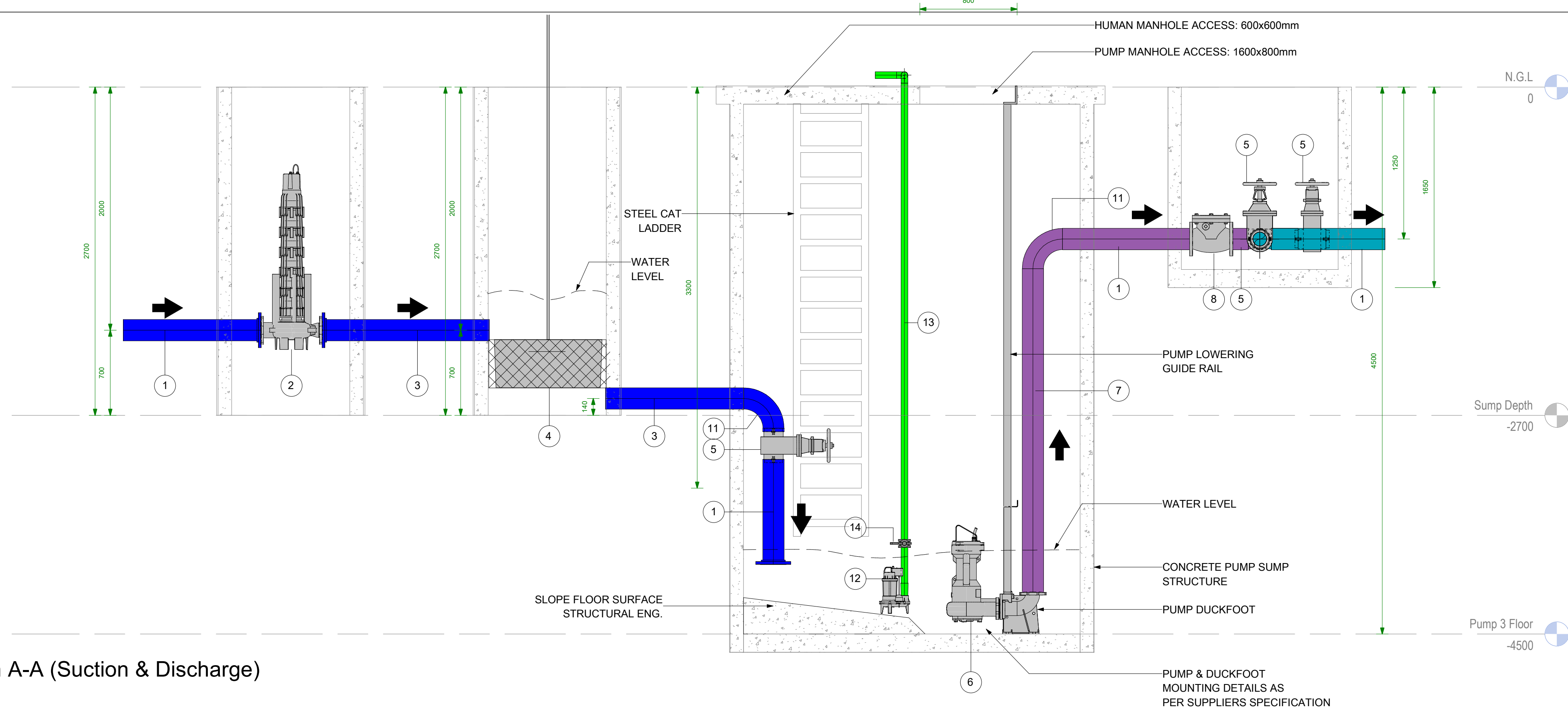
Pump Station 3 Detail Layout

1 : 25

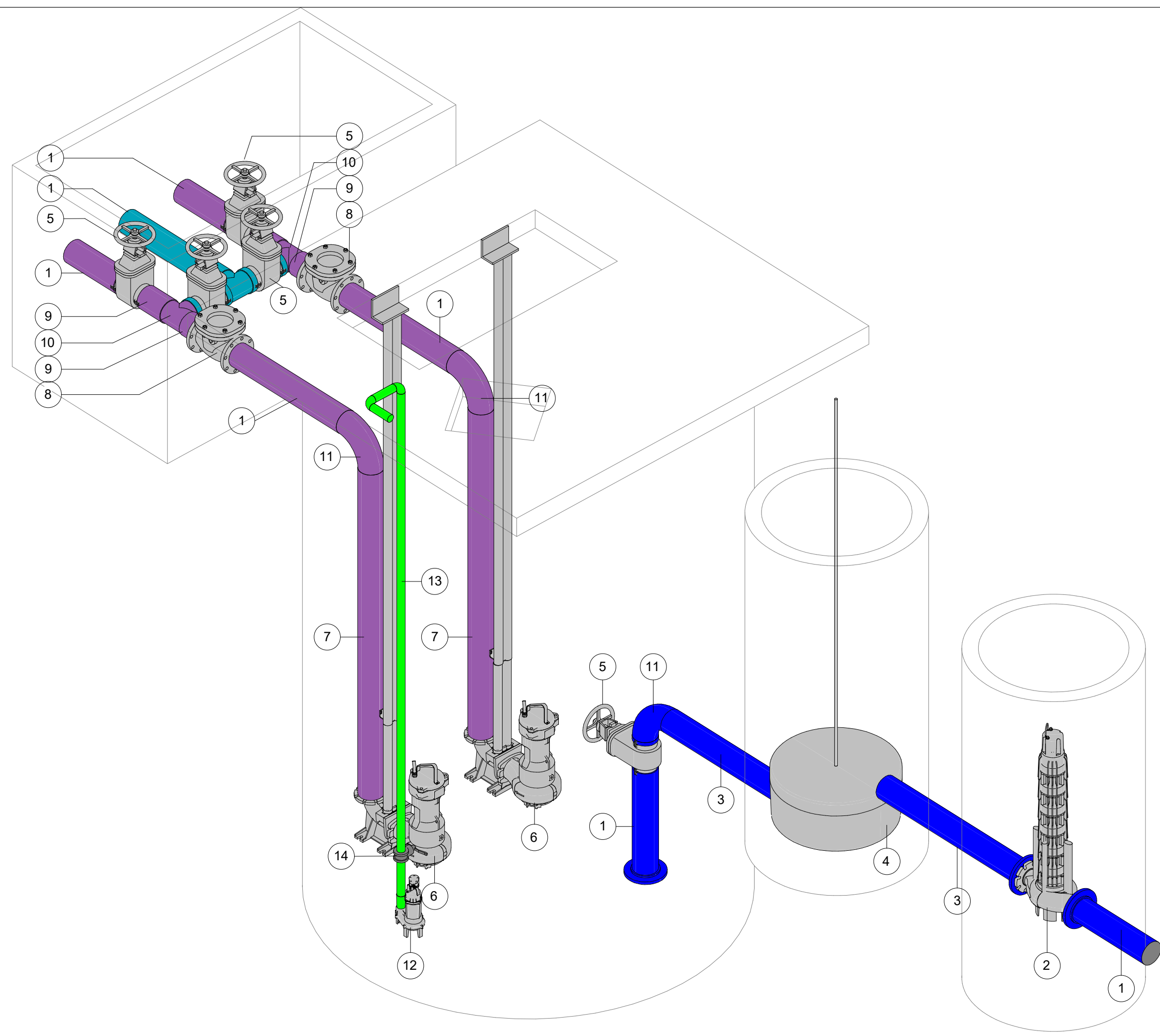


Cross Section A-A (Suction & Discharge)

1 : 25

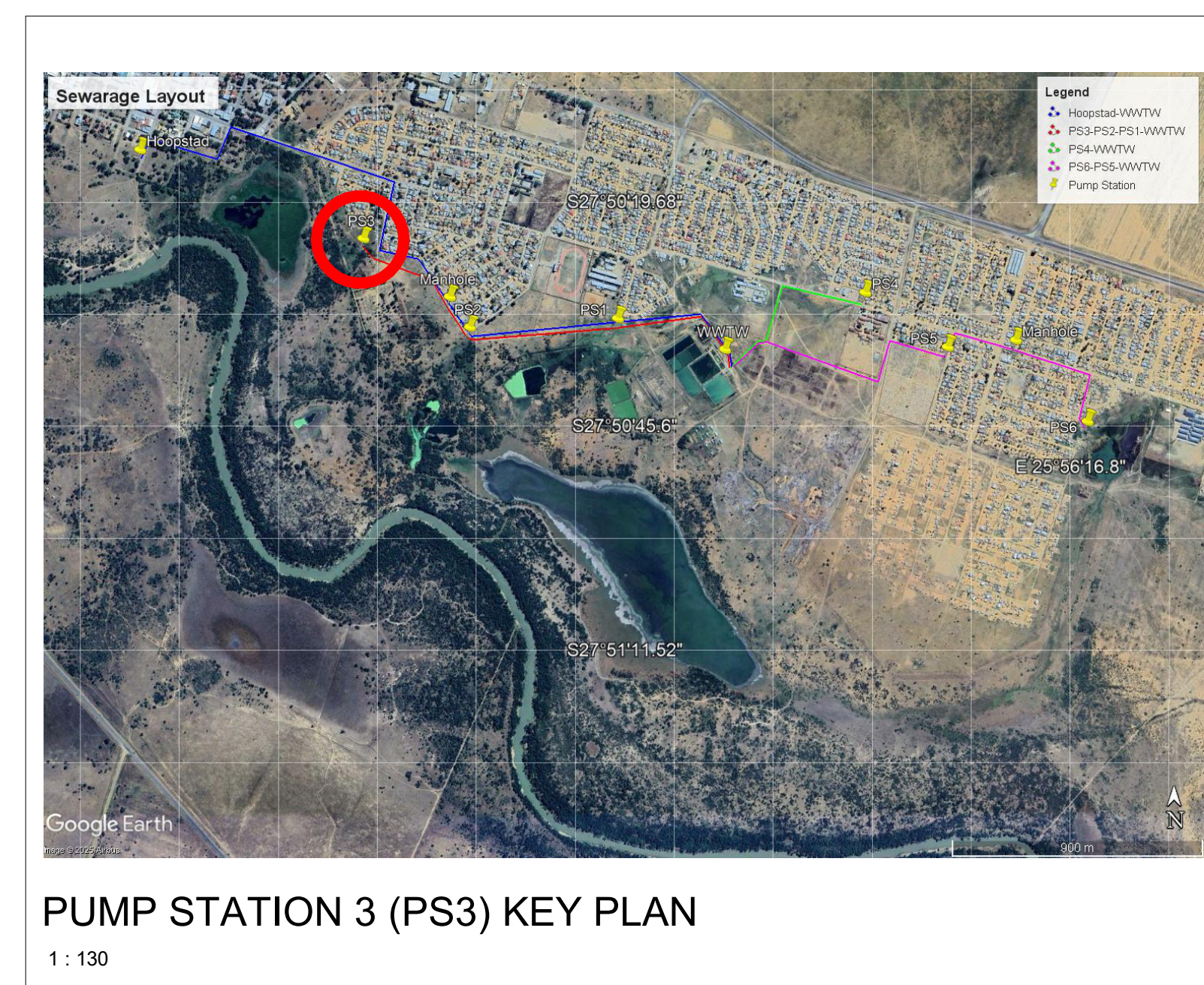
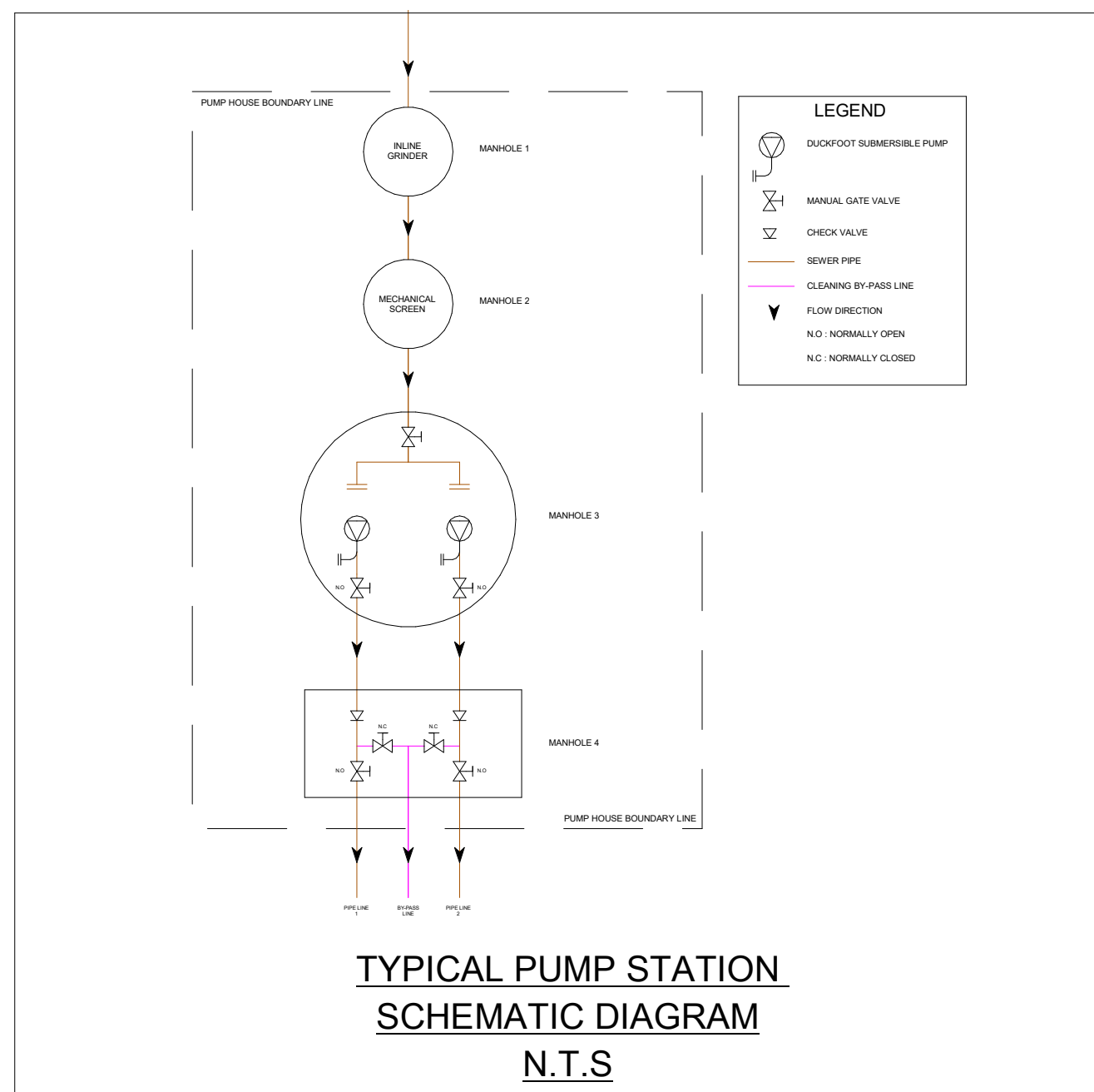


3D PUMP STATION 3



SCHEDULE OF ITEMS

| POSITION: PUMP STATION 3 |     |       |                      |                 |                 |                               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                               | DIMENSIONS |
|--------------------------|-----|-------|----------------------|-----------------|-----------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| REF                      | QTY | CLASS | CORROSION PROTECTION | INTERNAL LINING | EXTERNAL LINING | FINAL COLOR                   |                                                                                                                                                                                                                                                                                                                                                           |            |
| 1                        | 7   | PN 10 | TBC                  | TBC             |                 | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                                    | mm<br>1100 |
| 2                        | 2   | PN 6  | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | INLINE SEWER GRINDER FLOW : 233 L/s WORKING PRESSURE : 6 BAR ELECTRIC MOTOR : 3.0kW @ 400V/3ph/50Hz DIMENSION : (W=150mm,D=100mm,C=500mm) INLET PIPE SIZE : Ø150mm OUTLET PIPE SIZE : 150mm WEIGHT : 224 kg HOUSING : DUCTILE IRON CUTTERS : HARDENED ALLOY STEEL Ø120mm SHAFTS : HARDENED ALLOY STEEL 50mm Hex MECHANICAL SEALS : TUNGSTEN CARBIDE FACES | mm<br>1500 |
| 3                        | 2   | PN 10 | TBC                  | TBC             |                 | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                                    | mm<br>1500 |
| 4                        | 1   | N/A   | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | Ø950mm MANUALLY OPERATED MECHANICAL BASKET SCREEN                                                                                                                                                                                                                                                                                                         | mm<br>1500 |
| 5                        | 6   | PN 10 | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | Ø160mm FLANGED GATE VALVE                                                                                                                                                                                                                                                                                                                                 | mm<br>1500 |
| 6                        | 2   | PN 16 | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | SUBMERSIBLE SEWER PUMP (DUCKFOOT TYPE WITH GUIDE RAIL) FLOW : 8.59 L/s @ HEAD = 7.55m RATED PRESSURE : 16 BAR ELECTRIC MOTOR : 1.2kW @ 400V/3ph/50Hz OIL VOLUME : 12 L DIMENSION : (W=350mm,D=300mm,H=670mm) SUCTION SIZE : Ø200mm DISCHARGE SIZE : 180mm WEIGHT : 51 kg SPEED : 2905 rpm IMPELLER : S EFFICIENCY : 59.8 %                                | mm<br>1500 |
| 7                        | 2   | PN 10 | TBC                  | TBC             |                 | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                                    | mm<br>2700 |
| 8                        | 2   | PN 40 | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | Ø160mm FLANGED SWING CHECK VALVE                                                                                                                                                                                                                                                                                                                          | mm<br>1500 |
| 9                        | 9   | PN 10 | TBC                  | TBC             |                 | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                                    | mm<br>1500 |
| 10                       | 3   | PN 10 | TBC                  | TBC             |                 | BLACK                         | 160x160x160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                             | mm<br>1500 |
| 11                       | 3   | PN 10 | TBC                  | TBC             |                 | BLACK                         | Ø160mm BOTH ENDS FLANGED 90 DEGREES ELBOW LONG RADIUS, HDPE                                                                                                                                                                                                                                                                                               | mm<br>1500 |
| 12                       | 1   | PN 40 | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | SUBMERSIBLE PUMP SET (PUMP AND MOTOR SYSTEMS) FOR THE RE-WATERING OF THE PUMP CHAMBER/SUMP EACH WITH A CAPACITY OF 9.5 L/s AT A HEAD OF 9.5 METRES AT 1.2kW 380V, 50Hz, 3 PHASE, IES FREE BALL PASSAGE FOR SOLIDS HANDLING OF 50 MM                                                                                                                       | mm<br>1500 |
| 13                       | 1   | PN 10 | TBC                  | TBC             |                 | BLACK                         | Ø250mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                                    | mm<br>8000 |
| 14                       | 1   | PN 10 | TBC                  | TBC             |                 | AS PER SUPPLIER SPECIFICATION | Ø250mm GATE VALVE                                                                                                                                                                                                                                                                                                                                         | mm<br>8000 |



ISSUED FOR TENDER

| Rev               | Date       | by | Description       |
|-------------------|------------|----|-------------------|
| 1                 | 31.10.2025 | EM | ISSUED FOR TENDER |
| Revision Schedule |            |    |                   |

DRAWING ISSUED FOR

TENDER

COPY RIGHT RESERVED

CLIENT



CONSULTANT



|             |            |
|-------------|------------|
| APPROVED BY | M.M        |
| DESIGNED BY | A.N        |
| DRAWN BY    | E.M        |
| DATE        | 2025.10.31 |
| ECSA        | 201901008  |
| SIGNATURE   |            |

Project

TSWELOPELE SEWER PUMP STATION REFURBISHMENTS

|                |                       |            |    |
|----------------|-----------------------|------------|----|
| SCALE          | As Indicated          | SHEET SIZE | A0 |
| DRAWING NUMBER | PR00545_1V ME-402-PS3 |            |    |

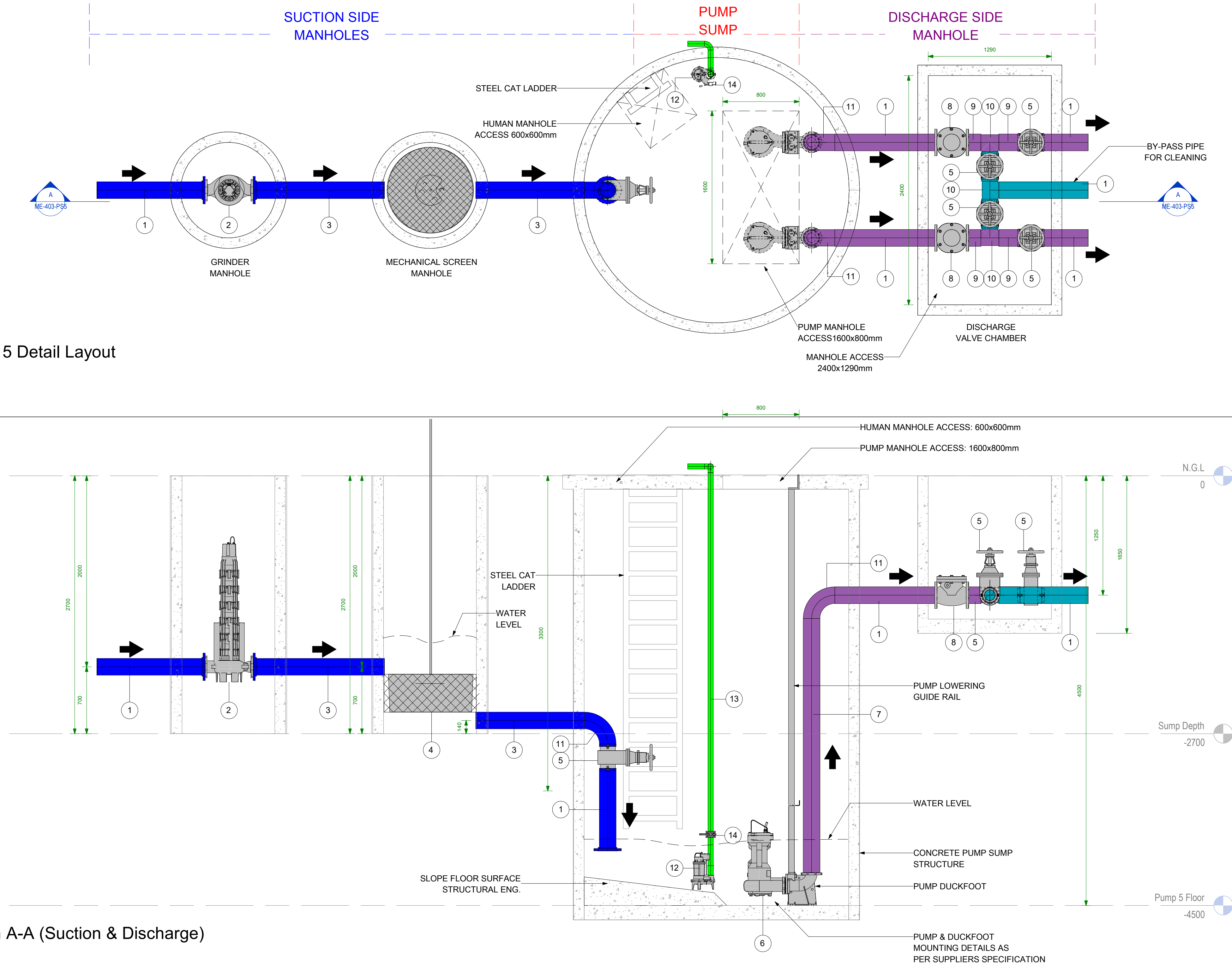
Discipline  
MECHANICAL ENGINEERING

Description  
SEWER PUMP STATION 3  
DETAIL LAYOUT



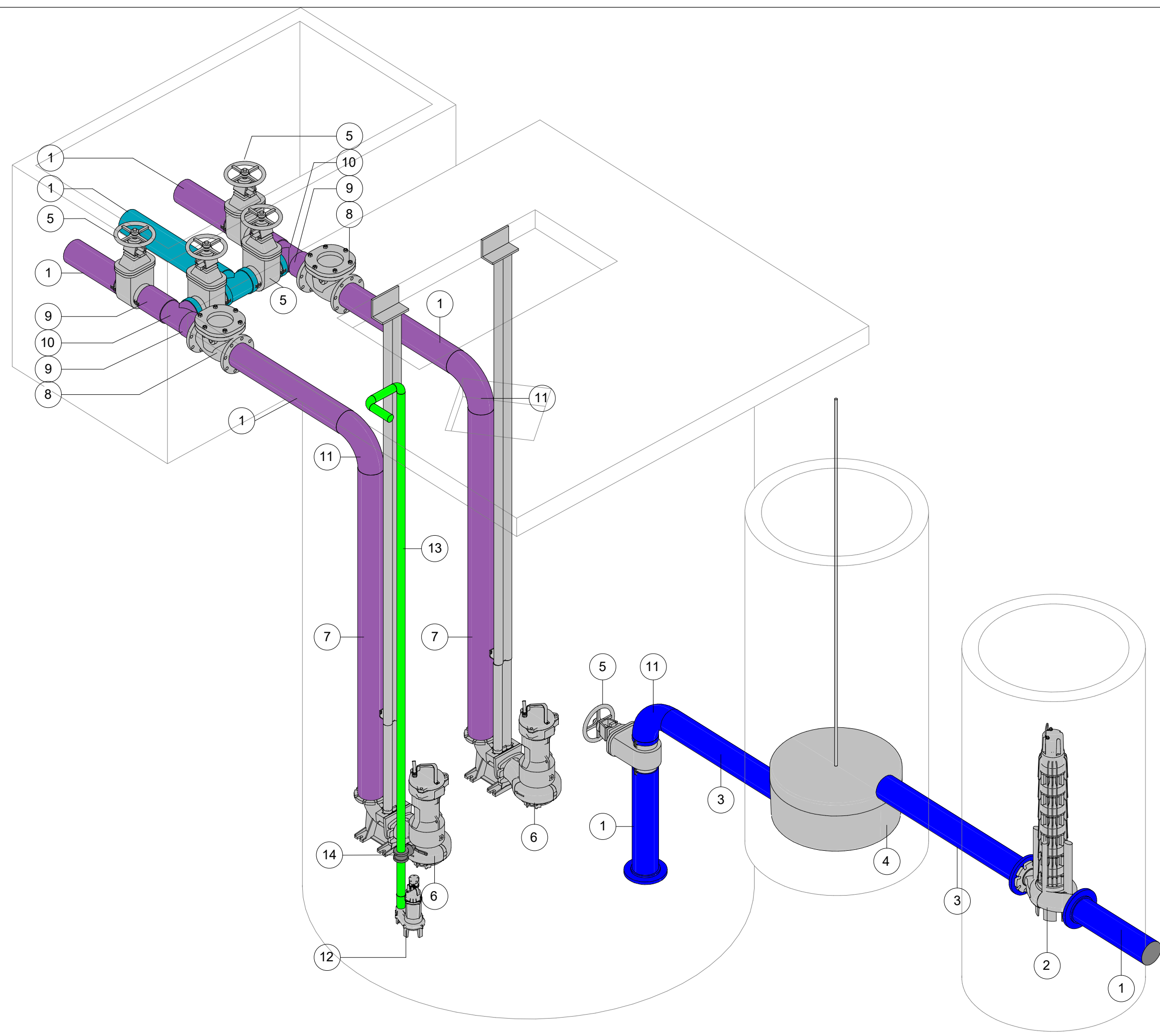
Pump Station 5 Detail Layout

1 : 25



Cross Section A-A (Suction & Discharge)

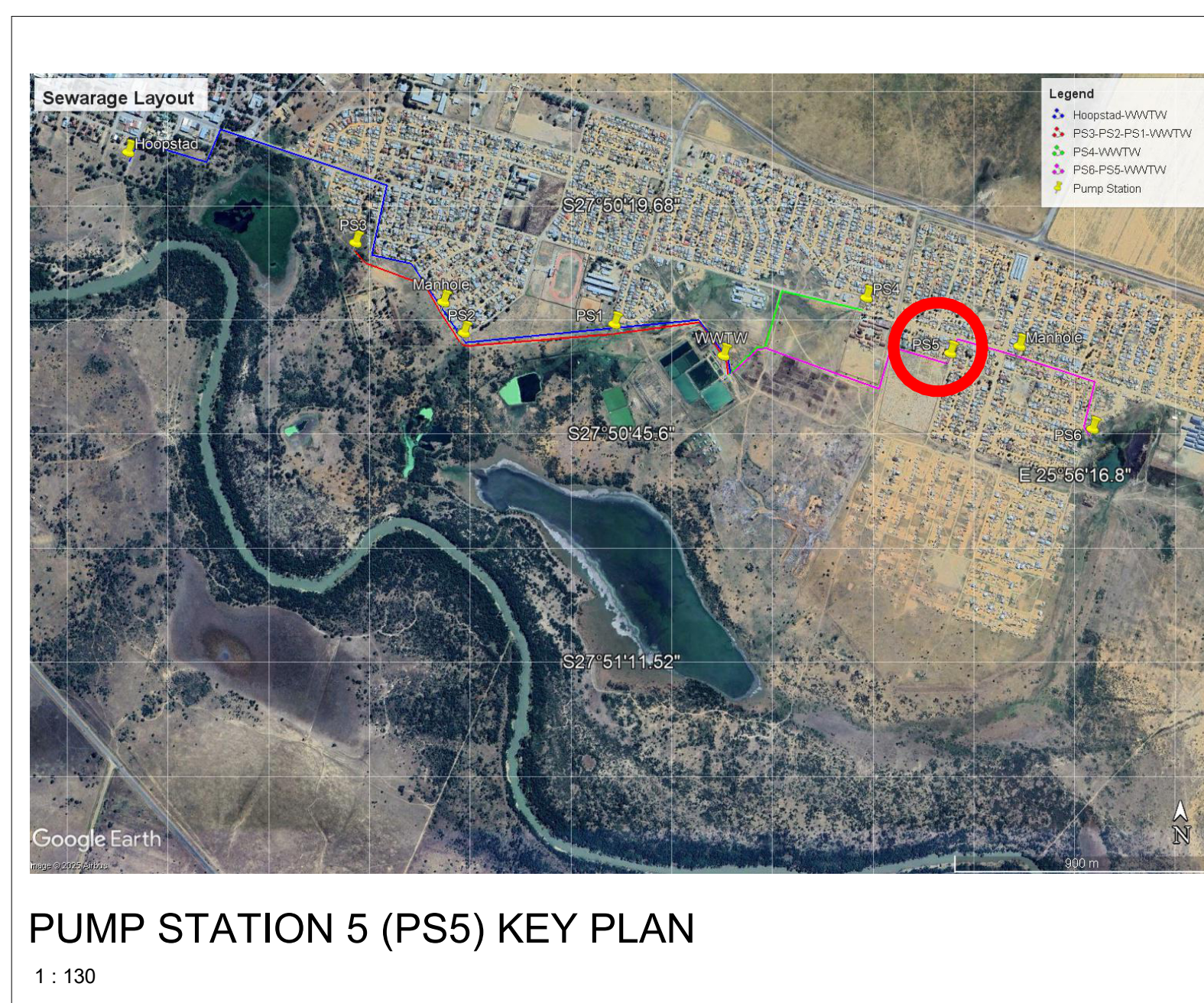
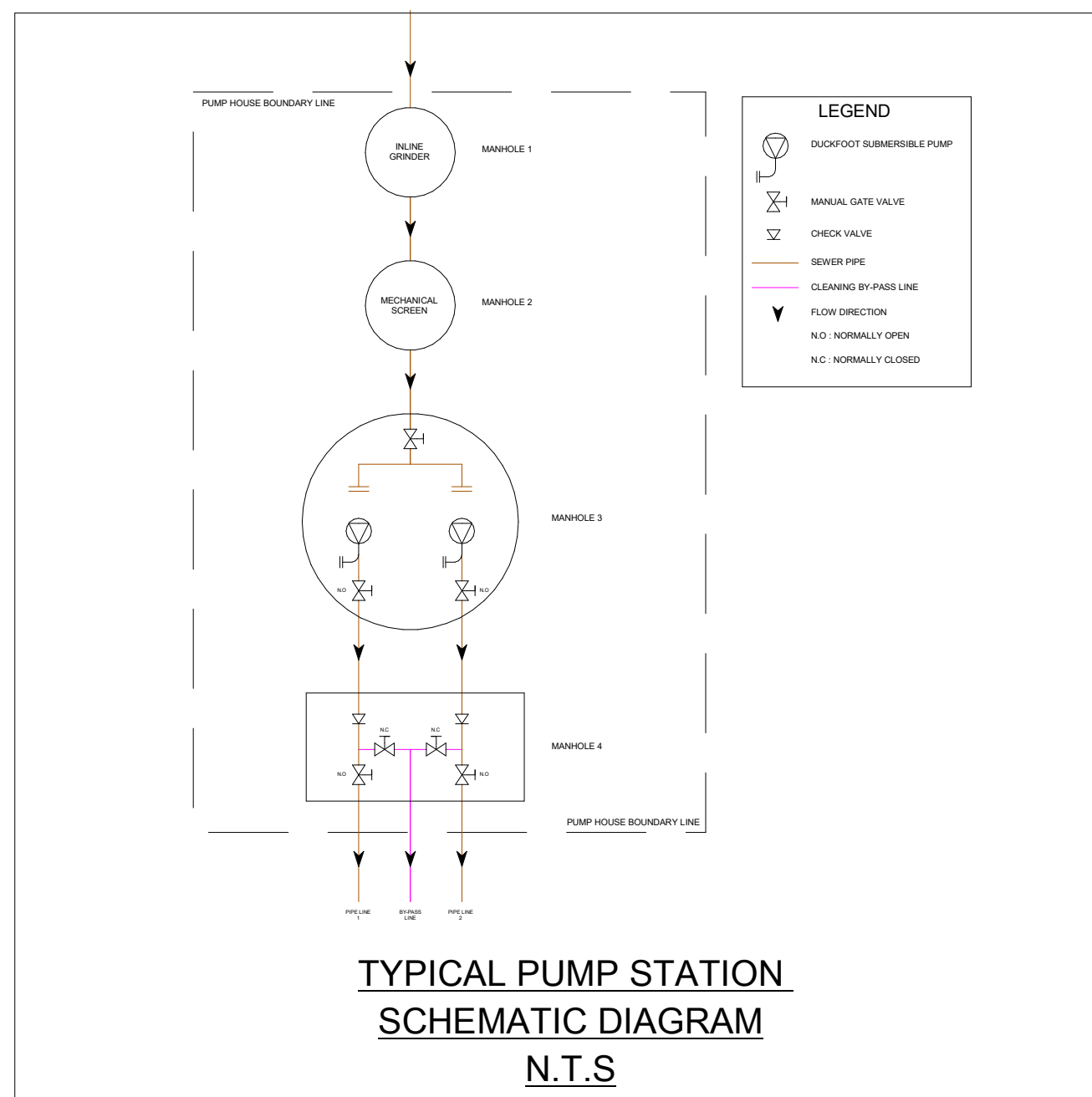
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3D PUMP STATION 5

SCHEDULE OF ITEMS

| POSITION: PUMP STATION 5 |     |       |                                         |                                         |                               |                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|-----|-------|-----------------------------------------|-----------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REF                      | QTY | CLASS | CORROSION PROTECTION<br>INTERNAL LINING | CORROSION PROTECTION<br>EXTERNAL LINING | FINAL COLOR                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                      |
| 1                        | 7   | PN 10 | TBC                                     | TBC                                     | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 2                        | 2   | PN 6  | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | INLINE SEWER GRINDER FLOW: 23.3 L/s WORKING PRESSURE: 6 BAR ELECTRIC MOTOR: 3.0kW @ 400V/3ph/50Hz DIMENSION: (A=1500mm,B=700mm,C=500mm) INLET PIPE SIZE: Ø150mm OUTLET PIPE SIZE: 150mm WEIGHT: 224 kg HOUSING: DUCTILE IRON CUTTERS: HARDENED ALLOY STEEL Ø120mm SHAFTS: HARDENED ALLOY STEEL 50mm Hex MECHANICAL SEALS: TUNGSTEN CARBIDE FACES |
| 3                        | 2   | PN 10 | TBC                                     | TBC                                     | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 4                        | 1   | N/A   | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | Ø950mm MANUALLY OPERATED MECHANICAL BASKET SCREEN                                                                                                                                                                                                                                                                                                |
| 5                        | 6   | PN 10 | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | Ø160mm FLANGED GATE VALVE                                                                                                                                                                                                                                                                                                                        |
| 6                        | 2   | PN 16 | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | SUBMERSIBLE SEWER PUMP (DUCKFOOT TYPE WITH GUIDE RAIL FLOW: 13.4 L/s @ HEAD = 11.0m RATED PRESSURE: 16 BAR ELECTRIC MOTOR: 2.4kW @ 400V/3ph/50Hz OIL VOLUME: 0.2 L DIMENSION: (W=300mm,D=300mm,H=670mm) SUCTION SIZE: Ø50mm DISCHARGE SIZE: Ø80mm WEIGHT: 43 kg SPEED: 2780 rpm IMPELLER: TR EFFICIENCY: 60.9 %                                  |
| 7                        | 2   | PN 10 | TBC                                     | TBC                                     | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 8                        | 2   | PN 40 | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | Ø160mm FLANGED SWING CHECK VALVE                                                                                                                                                                                                                                                                                                                 |
| 9                        | 9   | PN 10 | TBC                                     | TBC                                     | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 10                       | 3   | PN 10 | TBC                                     | TBC                                     | BLACK                         | 100x160x160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                    |
| 11                       | 3   | PN 10 | TBC                                     | TBC                                     | BLACK                         | Ø160mm BOTH ENDS FLANGED 90 DEGREES ELBOW LONG RADIUS, HDPE                                                                                                                                                                                                                                                                                      |
| 12                       | 1   | PN 40 | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | SUBMERSIBLE PUMP SET (PUMP AND MOTOR SYSTEMS) FOR THE RE-WATERING OF THE PUMP CHAMBER/SUMP EACH WITH A CAPACITY OF 9.5 L/s AT A HEAD OF 9.5 METRES AT 1.2kW 380V, 50HZ, 3 PHASE, IES FREE BALL PASSAGE FOR SOLIDS HANDLING OF 50 MM                                                                                                              |
| 13                       | 1   | PN 10 | TBC                                     | TBC                                     | BLACK                         | Ø50mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                            |
| 14                       | 1   | PN 10 | TBC                                     | TBC                                     | AS PER SUPPLIER SPECIFICATION | Ø50mm GATE VALVE                                                                                                                                                                                                                                                                                                                                 |



| Legend |                          |
|--------|--------------------------|
|        | HDPE Pipe Discharge Line |
|        | HDPE Pipe Suction Line   |
|        | HDPE Pipe By-Pass Line   |
|        | HDPE Pipe Drain          |
|        | Flow Direction           |

- CONTRACTOR IS TO SUBMIT THEIR SHOP DRAWINGS BASED ON THESE DESIGN DRAWINGS FOR APPROVAL BY THE ENGINEER PRIOR TO ANY PIPE WORK BEING ORDERED.
- ANY PIPES ORDERED WITHOUT THE APPROVAL OF THE ENGINEER WILL BE RECTIFIED AT THE CONTRACTORS OWN COST.
- EACH ITEM IS TO BE CLEARLY MARKED ACCORDING TO THE NUMBERS GIVEN IN THE LIST.
- ALL FLANGES ARE TO BE IN ACCORDANCE WITH SABS 1123, UNLESS STATED DIFFERENTLY.

| CLASS | WORKING PRESSURE | TABLE SANS1123 |
|-------|------------------|----------------|
| 6     | 600kPa           | 1 000/3        |
| 10    | 1000kPa          | 1 600/3        |
| 16    | 1600kPa          | 2 500/3        |
| 25    | 2500kPa          | 4 000/3        |
| 40    | 4000kPa          |                |

\* FLAT FACED FLANGES TO BE USED TESTING PRESSURE: 1.5 x WORKING PRESSURE, FOR ALL FLANGES, COUPLING AS WELL AS PUDDLE FLANGES.

GASKETS FOR PRESSURE RATINGS UP TO AND INCLUDING 2 500 kPa, SHALL BE CUT FROM MATERIAL MANUFACTURED TO THE SPECIFICATION SEP. IES, OR EQUIVALENT. GASKETS FOR PRESSURE RATINGS ABOVE 2 500 kPa UP TO AND INCLUDING 4 000 kPa, SHALL BE CUT FROM MATERIAL MANUFACTURED TO THE SPECIFICATION S.S. 2815.8, OR EQUIVALENT. GASKETS FOR PRESSURE RATINGS UP TO AND INCLUDING 1 600 kPa SHALL BE 3 mm THICK CAF FULL FACE GASKETS. GASKETS FOR PRESSURE RATINGS ABOVE 1 600 kPa SHALL BE 3 mm THICK CAF RING GASKETS.

4. PROTECTION CODES:  
EP: ALL SURFACES SHALL BE BLAST CLEANED TO SA 2½ AND TO BE COATED WITH 3 LAYERS OF EPOXY RESIN TO GIVE A MIN. DRY FILM THICKNESS OF 300µm.  
FP: FACTORY PROTECTION.  
BG: BRILLIANT GREEN.

5. MATERIAL: GRADE C CARBON STEEL AS PRESCRIBED IN SANS 719. ALL PIPE ITEMS TO BE A 5mm MINIMUM WALL THICKNESS UNLESS INDICATED DIFFERENTLY.  
6. VALVES: ALL VALVES TO BE FLANGED AND RATED PN10 MINIMUM. ALL GEARBOX POSITIONS TO BE AS FOR RIGHT HAND VALVE. RIGHT HAND PROJECTION, UNLESS STATED DIFFERENTLY ON DRAWINGS OR ITEM LIST. RESILIENT SEAL GATE: IN ACCORDANCE TO SABS 664. RIGHT HAND LOCKING. ALL VALVES ARE TO BE EQUIPPED WITH HAND WHEELS, UNLESS OTHERWISE STATED. VALVES TO BE SUPPLIED WITH THE NECESSARY PRESSURE REDUCERS AND / OR GEARS TO ENABLE FUNCTIONING AT THE SPECIFIED UNBALANCED PRESSURE.

7. ABBREVIATIONS:  
AC - ASBESTOS CEMENT  
CI - CAST IRON  
FA - FLANGE ADAPTOR  
FC - FLEXIBLE COUPLING  
GS - GALVANISED STEEL  
MS - MILD STEEL  
SS - STAINLESS STEEL

8. BOLTS  
BOLT LENGTHS SHALL MAKE ALLOWANCE FOR TWO x 3mm THICK WASHERS AND A 3mm THICK GASKET SHALL BE PROVIDED FOR EACH PIPE ITEM AS LISTED. BOLTS THAT PROTRUDE BEYOND THE NUT BY A MINIMUM OF TWO THREADS, WHEN THE ASSEMBLIES ARE FULLY TIGHTENED, SHALL BE USED.

A WASHER SHALL BE FITTED UNDER ALL BOLTS/SCREW HEADS AND NUTS.  
ALL BOLTS, NUTS AND WASHERS ON PIPE WORK TO BE HOT DIP GALVANISED MS.

9. PROVIDE APPROPRIATE BOLT UNITS (CONSISTING OF A STANDARD LENGTH BOLT, NUT AND TWO WASHERS) AND RING GASKET FOR EACH SET OF FLANGES AND FOR FLANGE ADAPTOR TO FLANGE INSTALLATIONS.

10. SUPPORTS AND ANCHOR SUPPORTS  
SUPPORTS OR ANCHOR SUPPORTS ARE REQUIRED FOR CERTAIN PIPE ITEMS. TENDERER TO SUBMIT DETAILS OF PROPOSED SUPPORTS AND ANCHORS AS PART OF WORKSHOP DRAWINGS REQUIRED FOR EACH PIPE ITEM. IF NOT DETAILED, NO SITE WELDING SHALL BE PERMITTED ON SUPPORTS OR ANCHORS, WHICH COULD DAMAGE FACTORY APPLIED CORROSION PROTECTION. ALL ANCHOR BOLTS TO BE 16 mm Ø MINIMUM OF 316 STAINLESS STEEL.

11. PIPE DETAILING:  
LAYOUTS DETAILED INCLUDE FOR A 3mm THICK GASKET.

12. PIPE ITEM DIMENSIONS ON DRAWINGS NEED TO BE VERIFIED BY THE CONTRACTOR ON SITE PRIOR TO THE MANUFACTURE OF ANY ITEMS.

PIPE COATING AND LINING NOTES:  
1. COATING TO BE A RIGID POLYURETHANE WITH A MINIMUM THICKNESS OF 2000 MICRONS  
2. LINING IS A SOLVENT FREE EPOXY WITH A MINIMUM THICKNESS OF 600MICRONS

| Rev               | Date       | by | Description       |
|-------------------|------------|----|-------------------|
| 1                 | 31.10.2025 | EM | ISSUED FOR TENDER |
| Revision Schedule |            |    |                   |

DRAWING ISSUED FOR

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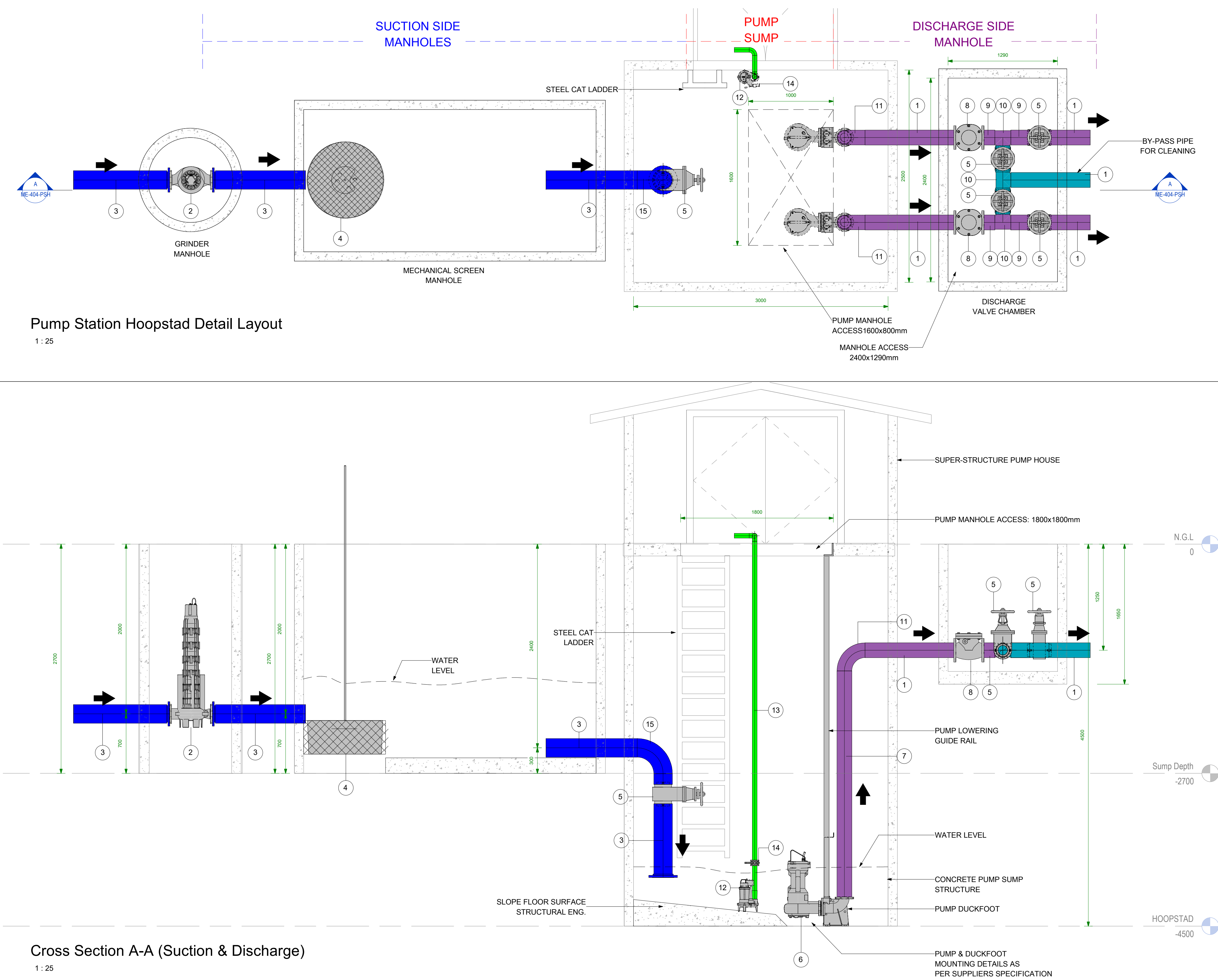
UNIT A3, CENTURION CLOSE  
119 GERHARD STREET  
CENTURION  
0157 GAUTENG, SOUTH AFRICA  
TEL: 012 664 6577  
FAX: 012 664 4875  
Email: mail@muteo.co.za  
Website: www.muteo.co.za

|             |            |
|-------------|------------|
| APPROVED BY | M.M        |
| DESIGNED BY | A.N        |
| DRAWN BY    | E.M        |
| DATE        | 2025.10.31 |
| ECSA        | 201901098  |
| SIGNATURE   |            |

|                |                                              |
|----------------|----------------------------------------------|
| Project        | Tswelopele Sewer Pump Station Refurbishments |
| SCALE          | As Indicated                                 |
| SHEET SIZE     | A0                                           |
| DRAWING NUMBER | PR00545_1V ME-403-PS5                        |

|             |                                       |
|-------------|---------------------------------------|
| Discipline  | MECHANICAL ENGINEERING                |
| Description | SEWER PUMP STATION 5<br>DETAIL LAYOUT |





| SCHEDULE OF ITEMS               |     |       |                      |                 |                               |                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|-----|-------|----------------------|-----------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POSITION: PUMP STATION HOOPSTAD |     |       |                      |                 |                               |                                                                                                                                                                                                                                                                                                                                                  |
| REF                             | QTY | CLASS | CORROSION PROTECTION | DESCRIPTION     | DIMENSIONS                    |                                                                                                                                                                                                                                                                                                                                                  |
|                                 |     |       | INTERNAL LINING      | EXTERNAL LINING | FINAL COLOR                   |                                                                                                                                                                                                                                                                                                                                                  |
| 1                               | 5   | PN 10 | TBC                  | TBC             | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 2                               | 2   | PN 6  | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | INLINE SEWER GRINDER FLOW: 23.3 L/s WORKING PRESSURE: 6 BAR ELECTRIC MOTOR: 3.0kW @ 400V/3ph/50Hz DIMENSION: (A=1500mm,B=700mm,C=500mm) INLET PIPE SIZE: Ø150mm OUTLET PIPE SIZE: 150mm WEIGHT: 224 kg HOUSING: DUCTILE IRON CUTTERS: HARDENED ALLOY STEEL Ø120mm SHAFTS: HARDENED ALLOY STEEL 50mm Hex MECHANICAL SEALS: TUNGSTEN CARBIDE FACES |
| 3                               | 4   | PN 10 | TBC                  | TBC             | BLACK                         | Ø200mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 4                               | 1   | N/A   | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | Ø950mm MANUALLY OPERATED MECHANICAL BASKET SCREEN                                                                                                                                                                                                                                                                                                |
| 5                               | 6   | PN 10 | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | Ø160mm FLANGED GATE VALVE                                                                                                                                                                                                                                                                                                                        |
| 6                               | 2   | PN 16 | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | SUBMERSIBLE SEWER PUMP (DUCKFOOT TYPE WITH GUIDE RAIL) FLOW: 14.4 L/s @ HEAD = 13.97m RATED PRESSURE: 16 BAR ELECTRIC MOTOR: 3.5kW @ 400V/3ph/50Hz OIL VOLUME: 1.0 l DIMENSION: (W=400mm,D=350mm,H=550mm) SUCTION SIZE: Ø100mm DISCHARGE SIZE: 60mm WEIGHT: 65 kg SPEED: 2800 rpm IMPELLER: LHM EFFICIENCY: 59 %                                 |
| 7                               | 2   | PN 10 | TBC                  | TBC             | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 8                               | 2   | PN 40 | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | Ø160mm FLANGED SWING CHECK VALVE                                                                                                                                                                                                                                                                                                                 |
| 9                               | 9   | PN 10 | TBC                  | TBC             | BLACK                         | Ø160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 10                              | 3   | PN 10 | TBC                  | TBC             | BLACK                         | 100x160x160mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                    |
| 11                              | 3   | PN 10 | TBC                  | TBC             | BLACK                         | Ø160mm BOTH ENDS FLANGED 90 DEGREES ELBOW LONG RADIUS, HDPE                                                                                                                                                                                                                                                                                      |
| 12                              | 1   | PN 40 | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | SUBMERSIBLE PUMP SET (PUMP AND MOTOR SYSTEMS) FOR THE RE-WATERING OF THE PUMP CHAMBER/SUMP EACH WITH A CAPACITY OF 9.5 L/s AT A HEAD OF 9.5 METRES AT 1.2kW 380V, 50Hz, 3 PHASE, IES FREE BALL PASSAGE FOR SOLIDS HANDLING OF 50 MM                                                                                                              |
| 13                              | 1   | PN 10 | TBC                  | TBC             | BLACK                         | Ø250mm HDPE PIPE, COMPLETE WITH FLANGED END CONNECTION                                                                                                                                                                                                                                                                                           |
| 14                              | 1   | PN 10 | TBC                  | TBC             | AS PER SUPPLIER SPECIFICATION | Ø50mm GATE VALVE                                                                                                                                                                                                                                                                                                                                 |

**Legend**

- HDPE Pipe Discharge Line
- HDPE Pipe Suction Line
- HDPE Pipe By-Pass Line
- HDPE Pipe Drain
- Flow Direction

1. CONTRACTOR IS TO SUBMIT THEIR SHOP DRAWINGS BASED ON THESE DESIGN DRAWINGS FOR APPROVAL BY THE ENGINEER PRIOR TO ANY PIPE WORK BEING ORDERED.  
ANY PIPES ORDERED WITHOUT THE APPROVAL OF THE ENGINEER WILL BE RECTIFIED AT THE CONTRACTORS OWN COST.  
2. ITEM: EACH ITEM IS TO BE CLEARLY MARKED ACCORDING TO THE NUMBERS GIVEN IN THE LIST  
3. ALL FLANGES ARE TO BE IN ACCORDANCE WITH SABS 1123, UNLESS STATED DIFFERENTLY.

| CLASS | WORKING PRESSURE | TABLE SABS 1123 |
|-------|------------------|-----------------|
| 6     | 600kPa           | 1 000/3         |
| 10    | 1000kPa          | 1 600/3         |
| 16    | 1600kPa          | 2 500/3         |
| 25    | 2500kPa          | 4 000/3         |
| 40    | 4000kPa          |                 |

\* FLAT FACED FLANGES TO BE USED  
TESTING PRESSURE: 1.5 x WORKING PRESSURE, FOR ALL FLANGES, COUPLING AS WELL AS PUDDLE FLANGES.

GASKETS FOR PRESSURE RATINGS UP TO AND INCLUDING 2 500 kPa, SHALL BE CUT FROM MATERIAL MANUFACTURED TO THE SPECIFICATION SEP. IES, OR EQUIVALENT.  
GASKETS FOR PRESSURE RATINGS ABOVE 2 500 kPa UP TO AND INCLUDING 4 000 kPa, SHALL BE CUT FROM MATERIAL MANUFACTURED TO THE SPECIFICATION S.S. 2815 B, OR EQUIVALENT.  
GASKETS FOR PRESSURE RATINGS (UP TO AND INCLUDING 1 600 kPa) SHALL BE 3 mm THICK CAF FULL FACE GASKETS.  
GASKETS FOR PRESSURE RATINGS ABOVE 1 600 kPa SHALL BE 3 mm THICK CAF RING GASKETS.

4. PROTECTION CODES:

EP: ALL SURFACES SHALL BE BLAST CLEANED TO SA 2½ AND TO BE COATED WITH 3 LAYERS OF EPOXY RESIN TO GIVE A MIN. DRY FILM THICKNESS OF 300µm.

FP: FACTORY PROTECTION.  
BG: BRILLIANT GREEN

5. MATERIAL: GRADE C CARBON STEEL AS PRESCRIBED IN SANS 719. ALL PIPE ITEMS TO BE 4.5mm MINIMUM WALL THICKNESS UNLESS INDICATED DIFFERENTLY.

6. VALVES: ALL VALVES TO BE FLANGED AND RATED PN10 MINIMUM. ALL GEARBOX POSITIONS TO BE AS FOR RIGHT HAND VALVE. RIGHT HAND PROJECTION, UNLESS STATED DIFFERENTLY ON DRAWINGS OR ITEM LIST. RESILIENT SEAL GATE: IN ACCORDANCE TO SABS 664. RIGHT HAND LOCKING. ALL VALVES ARE TO BE EQUIPPED WITH HAND WHEELS, UNLESS OTHERWISE STATED. VALVES TO BE SUPPLIED WITH THE NECESSARY PRESSURE REDUCERS AND / OR GEARS TO ENABLE FUNCTIONING AT THE SPECIFIED UNBALANCED PRESSURE.

7. ABBREVIATIONS:  
AC - ASBESTOS CEMENT  
CI - CAST IRON  
FA - FLANGE ADAPTOR  
FC - FLEXIBLE COUPLING  
GS - GALVANISED STEEL  
MS - MILD STEEL  
SS - STAINLESS STEEL

8. BOLTS  
BOLT LENGTHS SHALL MAKE ALLOWANCE FOR TWO x 3mm THICK WASHERS AND A 3mm THICK GASKET SHALL BE PROVIDED FOR EACH PIPE ITEM AS LISTED.  
BOLTS THAT PROTRUDE BEYOND THE NUT BY A MINIMUM OF TWO THREADS, WHEN THE ASSEMBLIES ARE FULLY TIGHTENED, SHALL BE USED.  
A WASHER SHALL BE FITTED UNDER ALL BOLTS/SCREW HEADS AND NUTS.  
ALL BOLTS, NUTS AND WASHERS ON PIPE WORK TO BE HOT DIP GALVANISED MS

9. PROVIDE APPROPRIATE BOLT UNITS (CONSISTING OF A STANDARD LENGTH BOLT, NUT AND TWO WASHERS) AND RING GASKET FOR EACH SET OF FLANGES AND FOR FLANGE ADAPTOR TO FLANGE INSTALLATIONS.

10. SUPPORTS AND ANCHOR SUPPORTS  
SUPPORTS OR ANCHOR SUPPORTS ARE REQUIRED FOR CERTAIN PIPE ITEMS. TENDERER TO SUBMIT DETAILS OF PROPOSED SUPPORTS AND ANCHORS AS PART OF WORKSHOP DRAWINGS REQUIRED FOR EACH PIPE ITEM. IF NOT DETAILED, NO SITE WELDING SHALL BE PERMITTED ON SUPPORTS OR ANCHORS, WHICH COULD DAMAGE FACTORY APPLIED CORROSION PROTECTION. ALL ANCHOR BOLTS TO BE 16 mm Ø MINIMUM OF 316 STAINLESS STEEL.

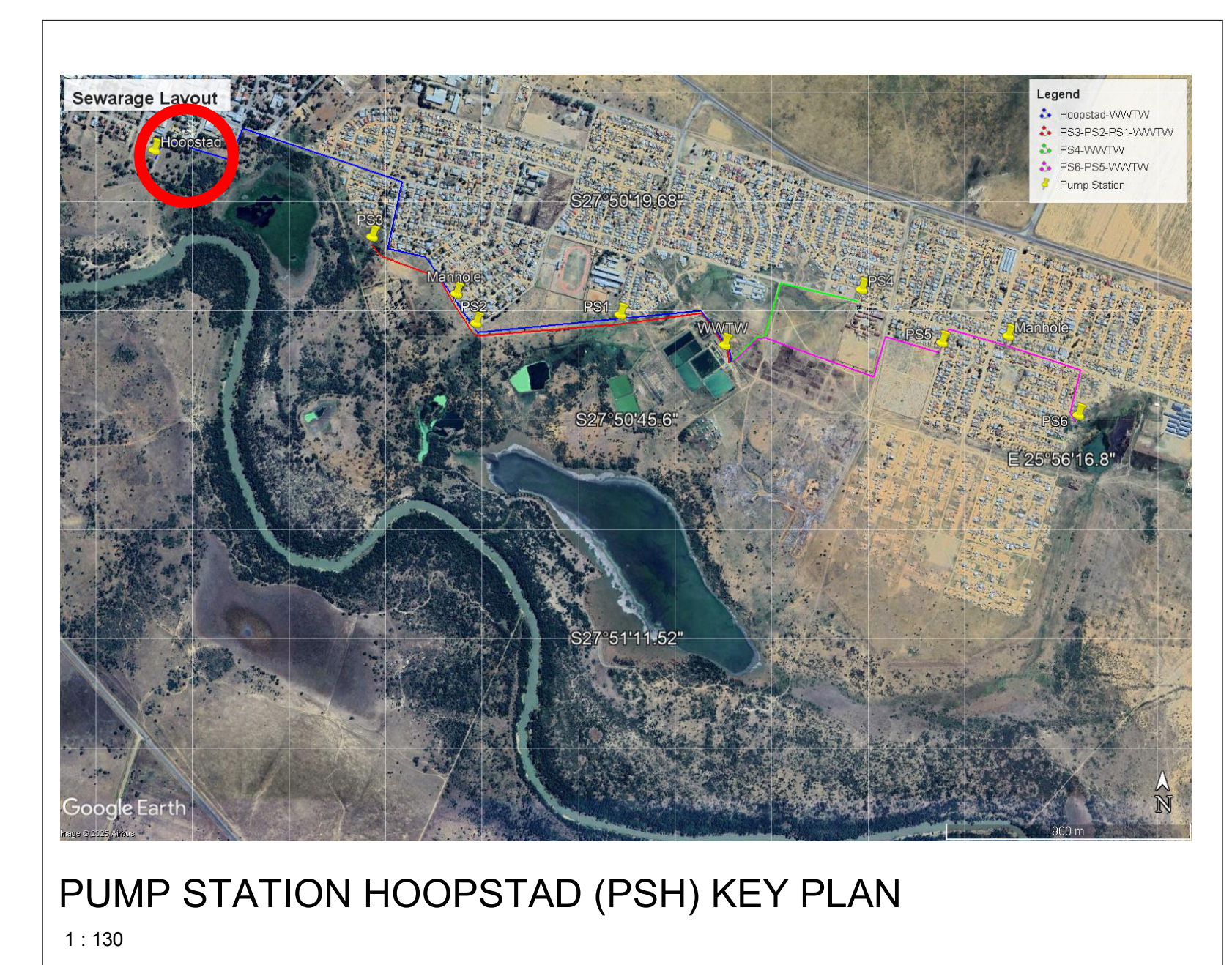
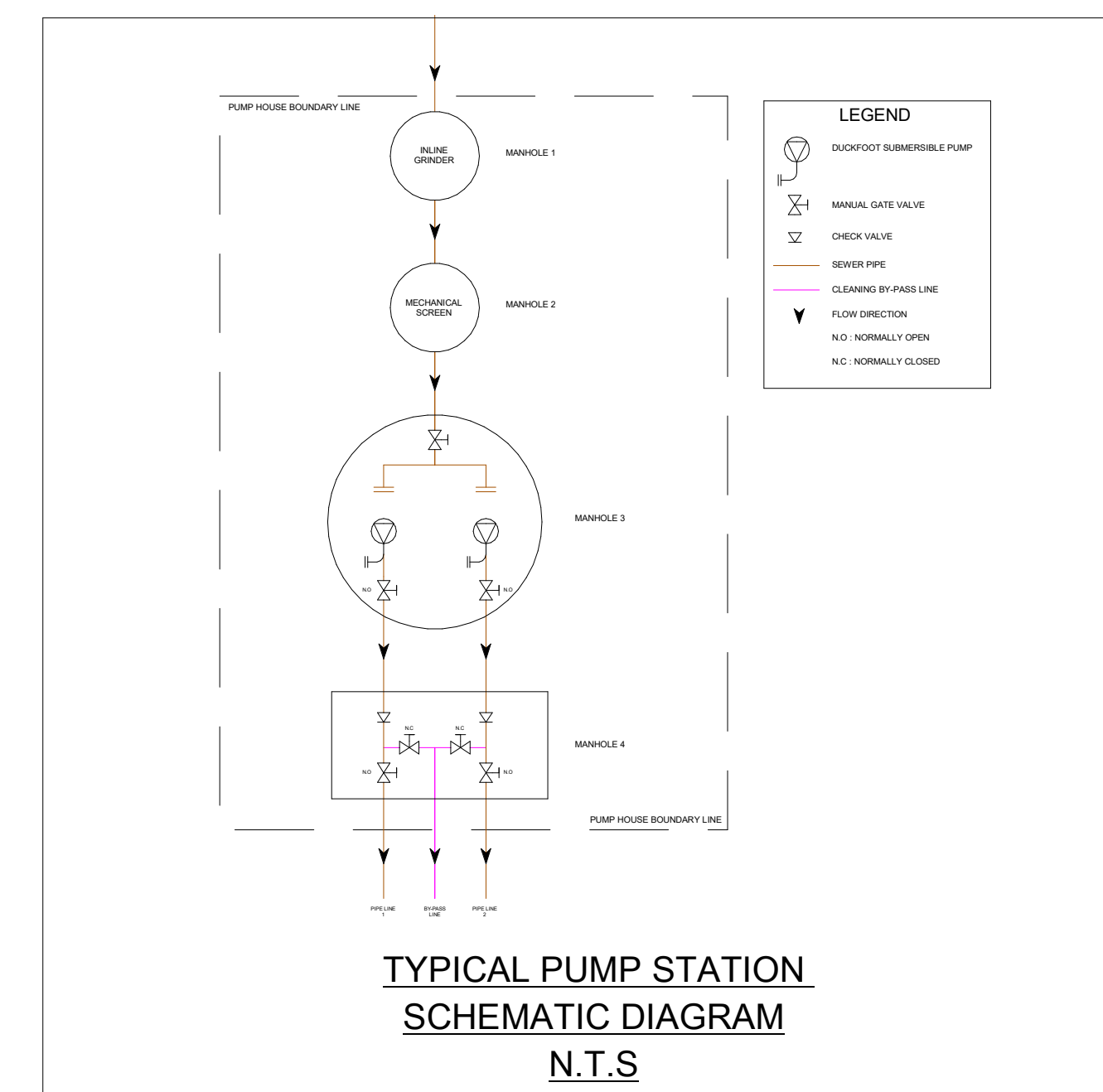
11. PIPE DETAILING:  
LAYOUTS DETAILED INCLUDE FOR A 3mm THICK GASKET.

12. PIPE ITEM DIMENSIONS ON DRAWINGS NEED TO BE VERIFIED BY THE CONTRACTOR ON SITE PRIOR TO THE MANUFACTURE OF ANY ITEMS.

PIPE COATING AND LINING NOTES:

1. COATING TO BE A RIGID POLYURETHANE WITH A MINIMUM THICKNESS OF 2000 MICRONS

2. LINING IS A SOLVENT FREE EPOXY WITH A MINIMUM THICKNESS OF 600MICRONS

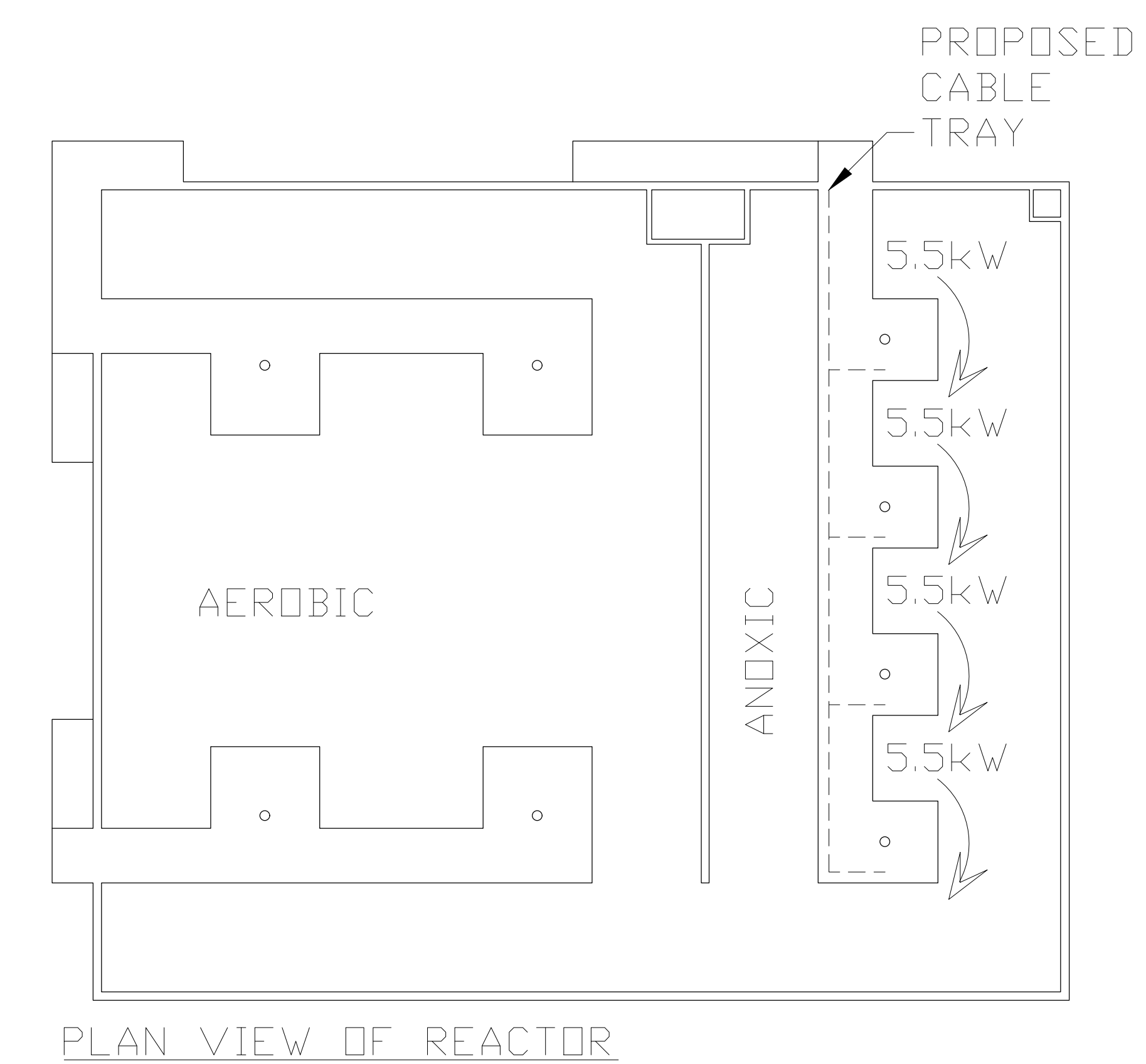
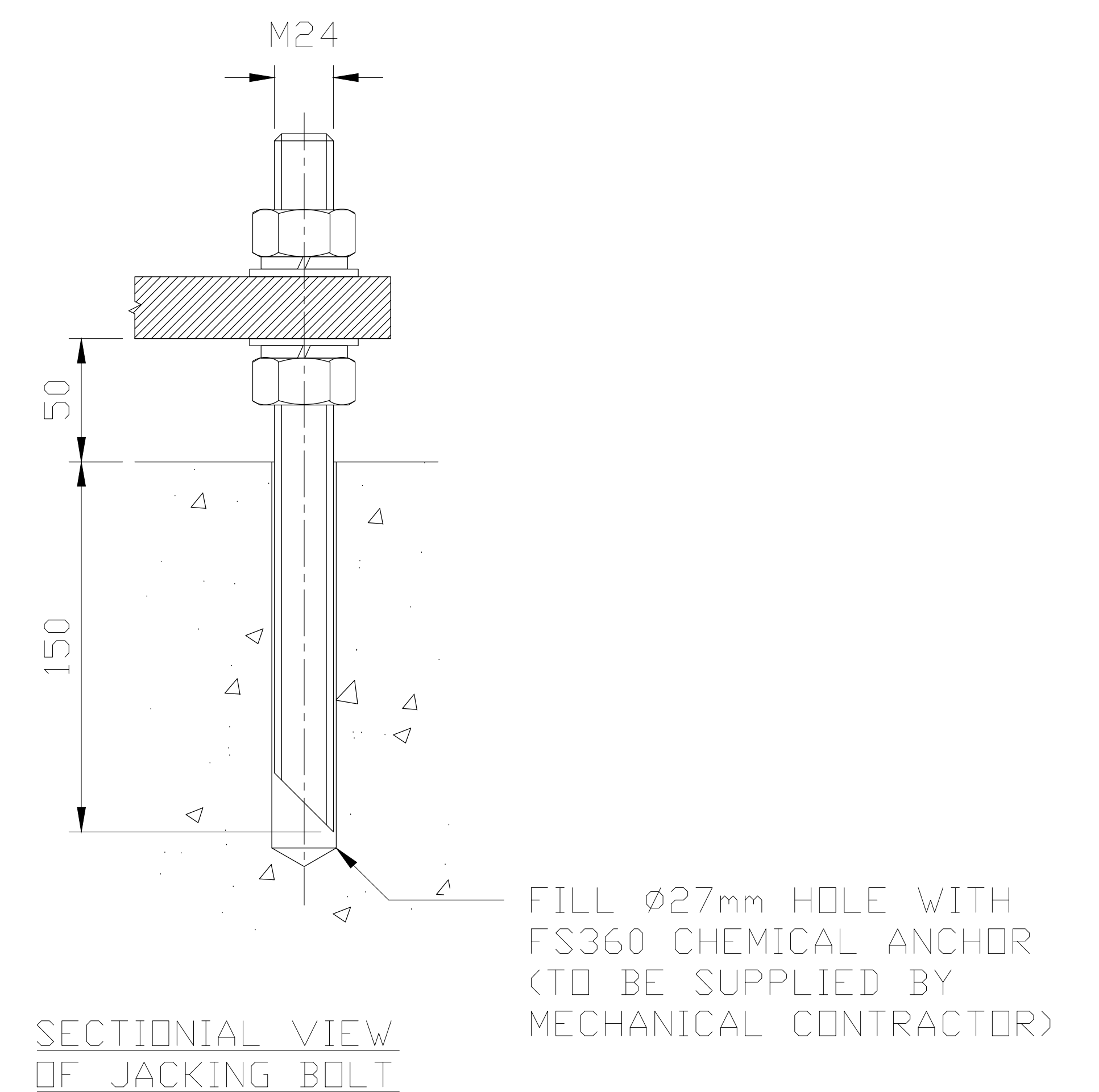
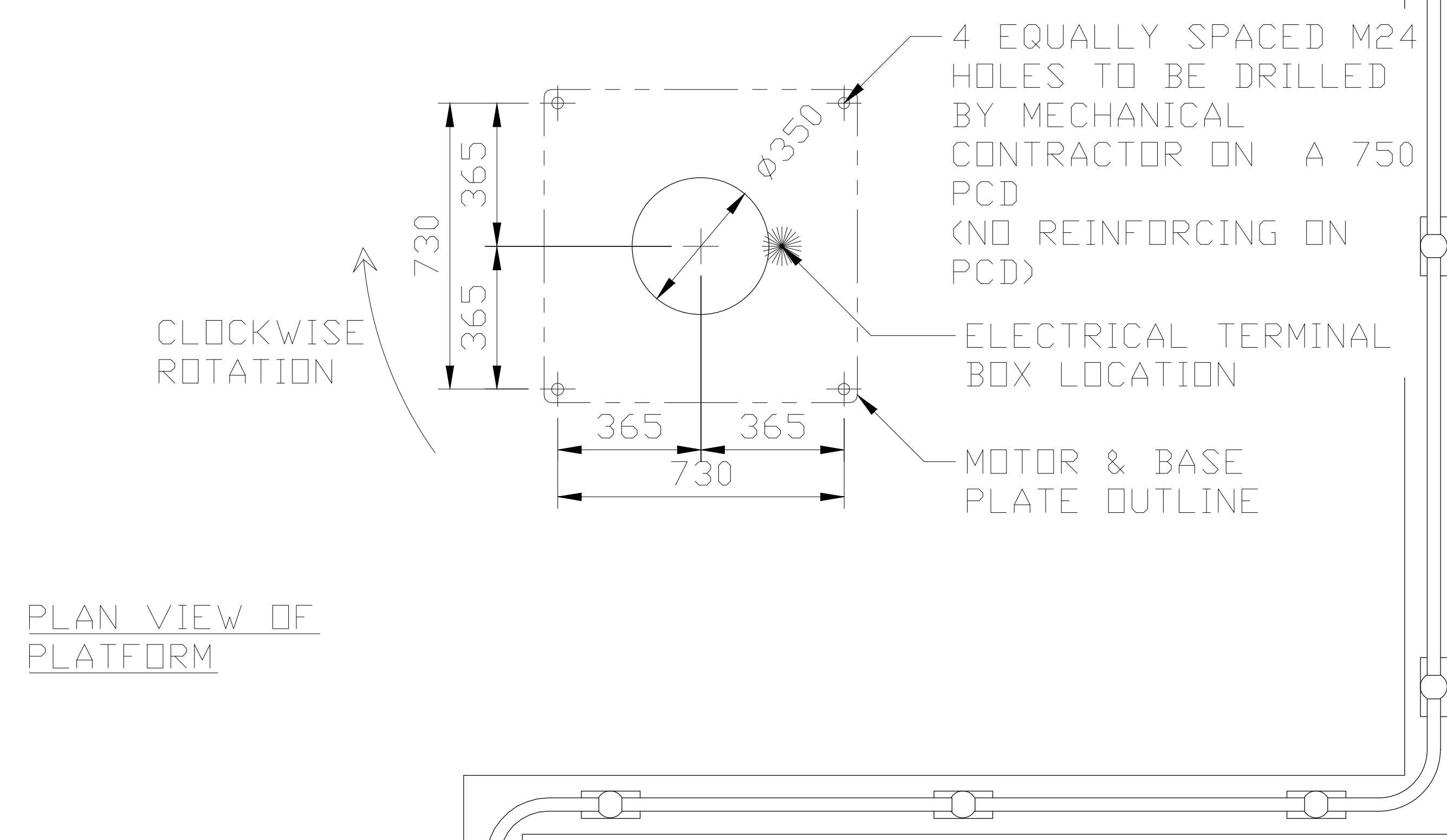
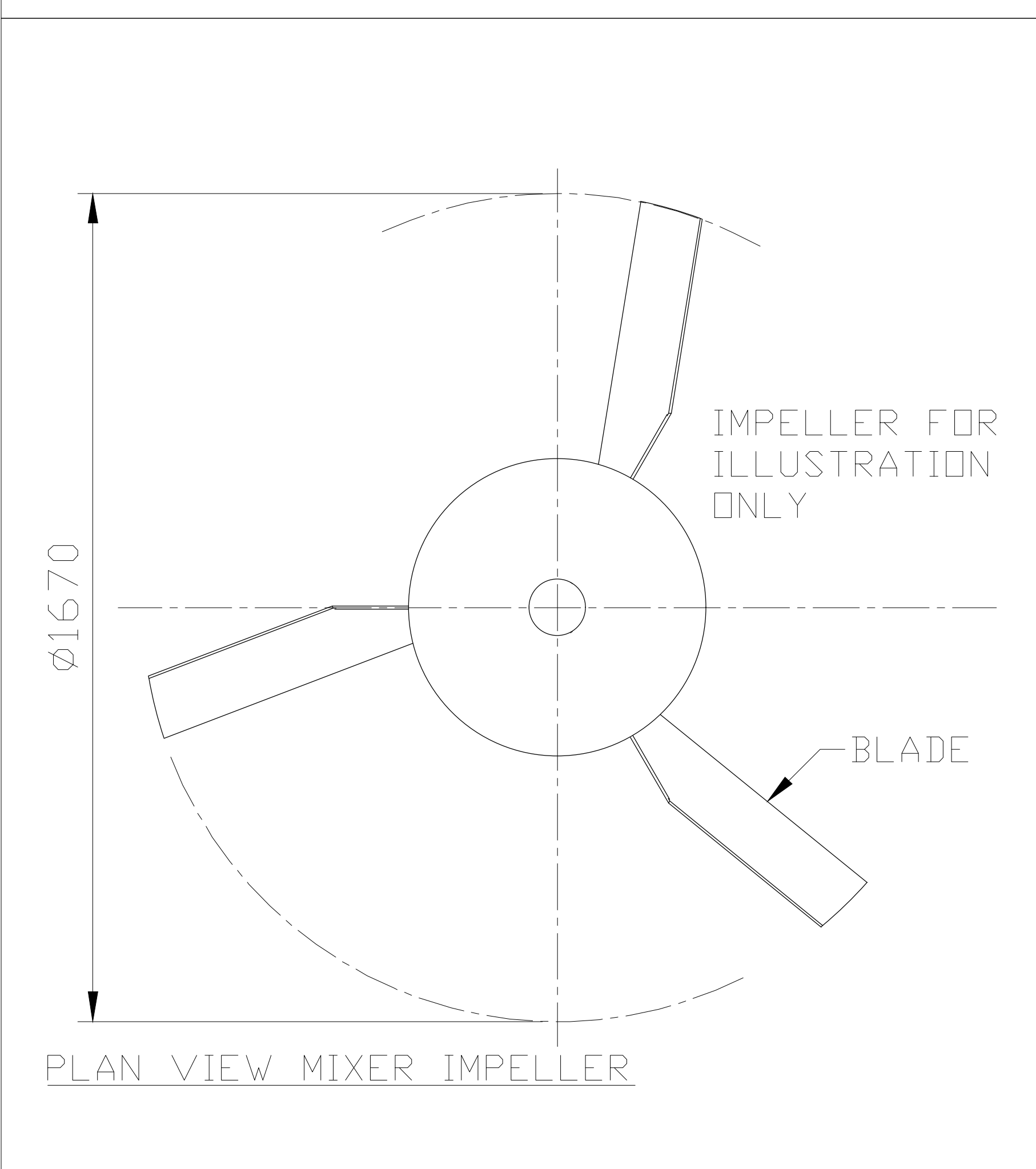
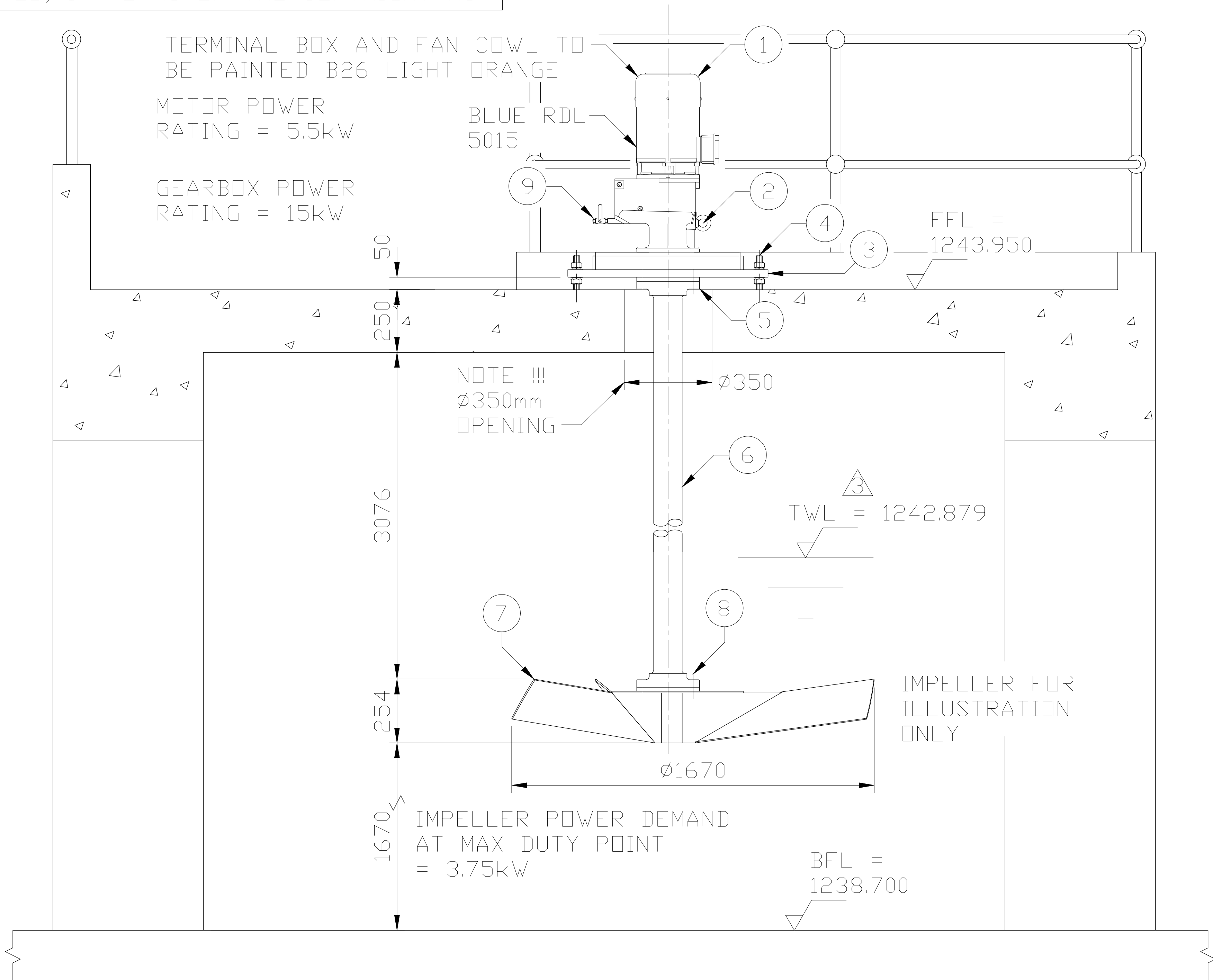


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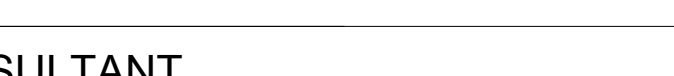


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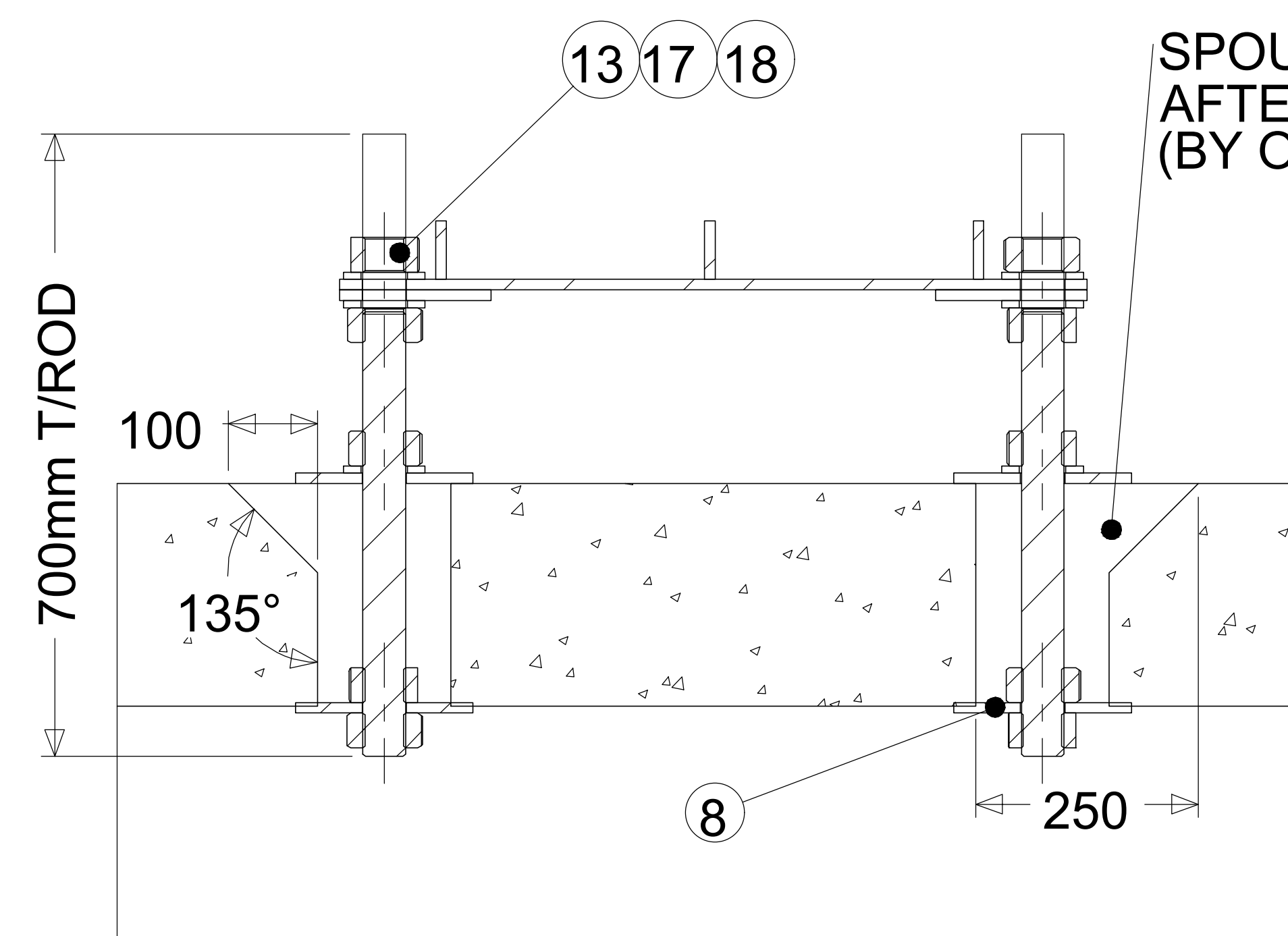
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| 9    | OIL DRAIN VALVE (OPTIONAL)               | CS / HDG                                                    | 1   |
| 8    | M16 BOLTS                                | 304 S/S                                                     | 9   |
| 7    | Ø1670 IMPELLER BLADE 6mm THICK           | 304 S/S                                                     | 1   |
| 6    | 100NB SOLID DRAWN TUBE SHAFT SCHEDULE 40 | 304 S/S                                                     | 1   |
| 5    | RIDGED HALF COUPLING                     | CI / TWO PART EPOXY                                         | 1   |
| 4    | M24 JACKING BOLT                         | 316 S/S (CLAUSE 10)                                         | 4   |
| 3    | 30mm BASE PLATE                          | CS / HDG & 2 PART EPOXY                                     | 1   |
| 2    | NORD SK52F 60rpm GEARBOX                 | CI / PAINT                                                  | 1   |
| 1    | NORD 132S/4 MOTOR 5.5kw 400V             | CI / PAINT                                                  | 1   |
| ITEM | DESCRIPTION                              | MATERIAL & COATING<br>AS PER SPECIFICATION<br>PAGE 5-6 OF 9 | QTY |

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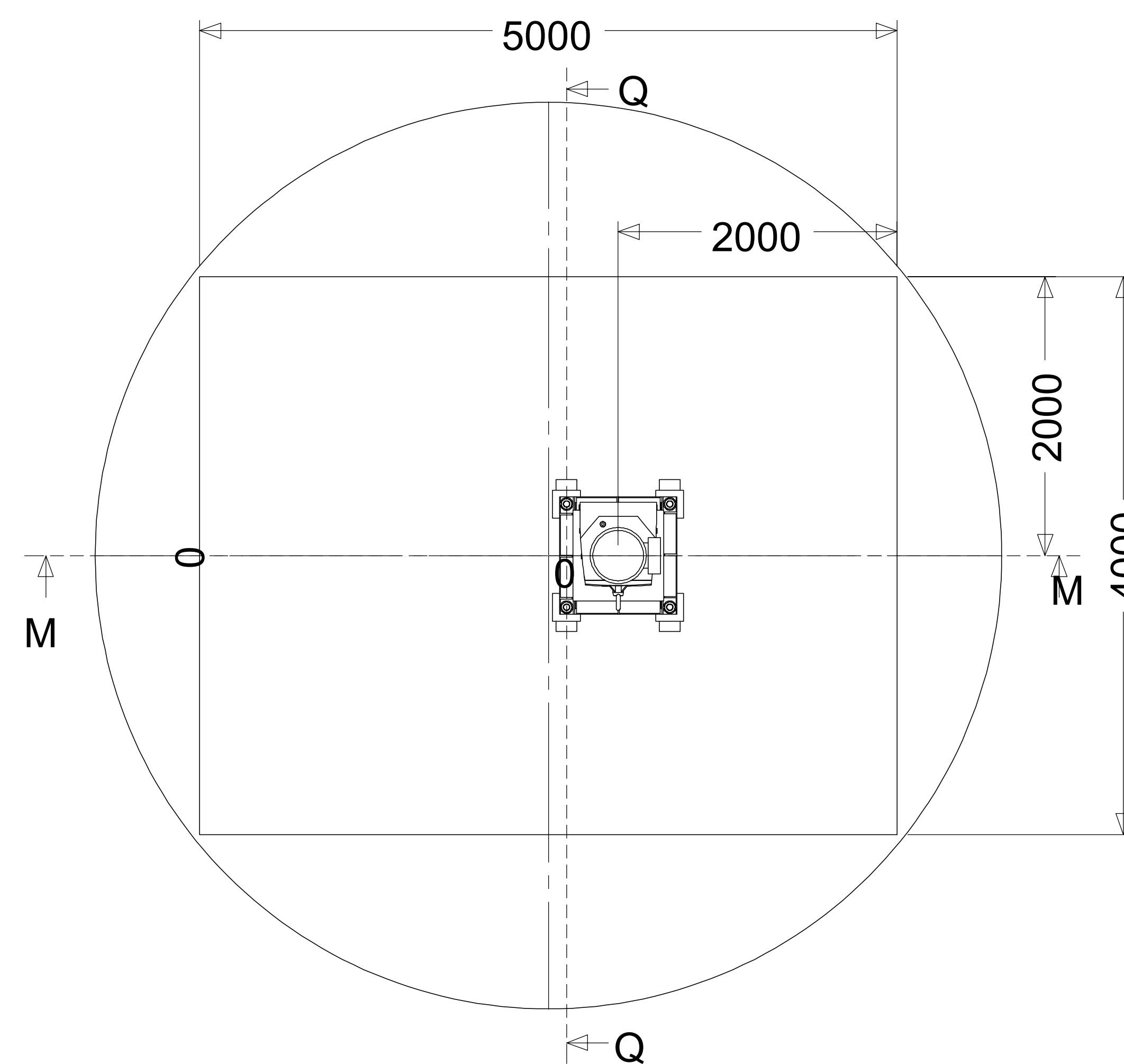
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|                   |  |  |  | DRAWING ISSUED FOR  |  | CLIENT                                                                                |  | CONSULTANT                                                                                    |  | APPROVED BY M.M                                                                       |  | Project                                      |  | Discipline             |  |
|                   |  |  |  | <div>TENDER</div>   |  |  |  |          |  | DESIGNED BY A.N                                                                       |  | TSWELOPELE SEWER PUMP STATION REFURBISHMENTS |  | MECHANICAL ENGINEERING |  |
|                   |  |  |  |                     |  |                                                                                       |  | UNIT A3, CENTURION CLOSE<br>119 GERHARD STREET<br>CENTURION<br>0157<br>GAUTENG, SOUTH AFRICA  |  | DRAWN BY E.M                                                                          |  |                                              |  | Description            |  |
|                   |  |  |  |                     |  |                                                                                       |  | TEL: 012 664 6577<br>FAX: 012 664 4875<br>Email: mail@muteo.co.za<br>Website: www.muteo.co.za |  | DATE 2025.10.31                                                                       |  |                                              |  | GA OF 5.5kW            |  |
|                   |  |  |  |                     |  |                                                                                       |  |                                                                                               |  | ECSA 201901008                                                                        |  |                                              |  | ANOXIC VERTICAL MIXER  |  |
|                   |  |  |  |                     |  |                                                                                       |  |                                                                                               |  | SIGNATURE                                                                             |  | SCALE As indicated SHEET SIZE A0             |  |                        |  |
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| Revision Schedule |  |  |  | COPY RIGHT RESERVED |  |                                                                                       |  |                                                                                               |  |                                                                                       |  |                                              |  |                        |  |
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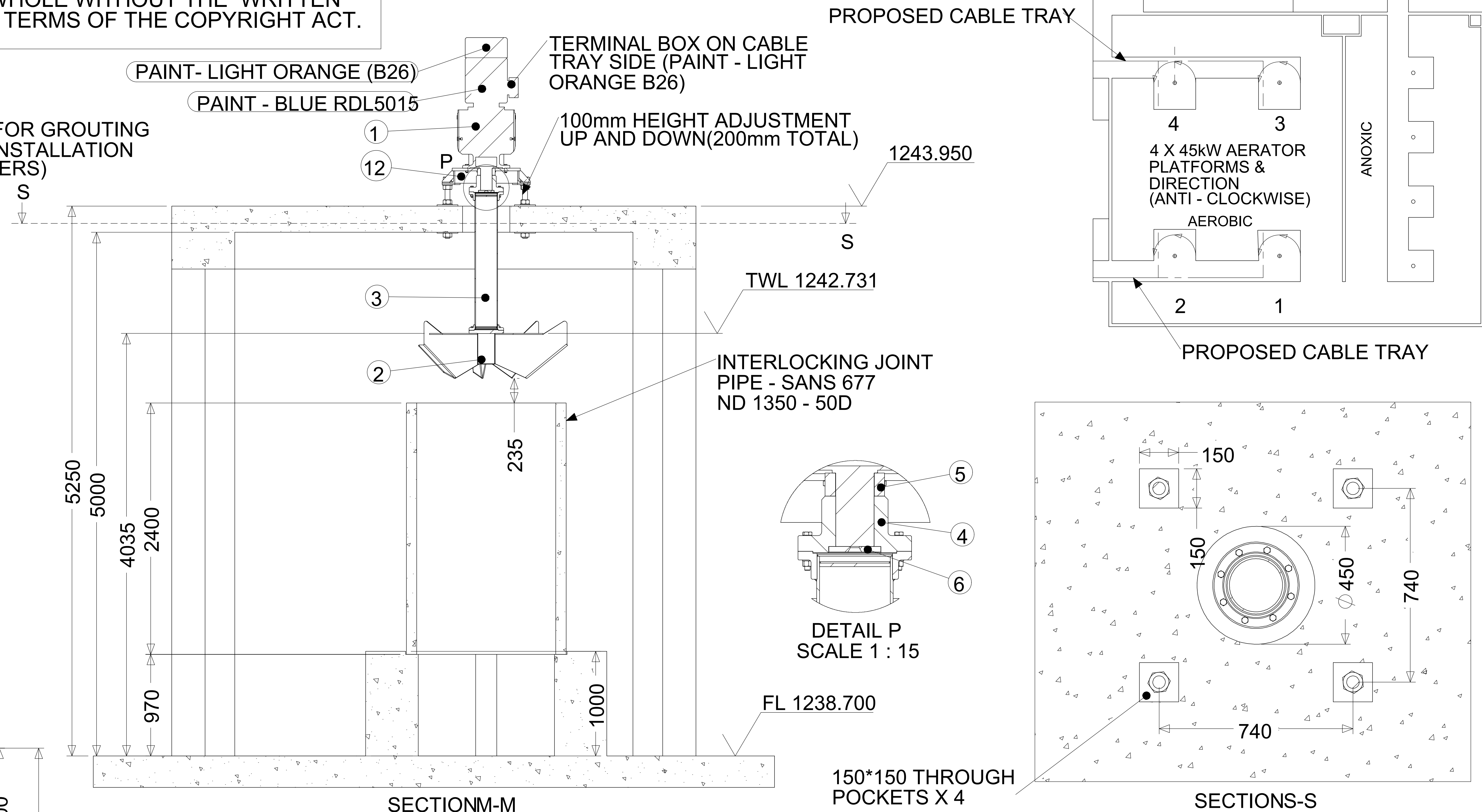
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SECTION Q-Q  
SCALE 1 : 15



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SECTIONM-M

SCALE 1 : 50

| ITEM NO. | PART NUMBER                      | NUMBER         | DESCRIPTION                        | Finish                                       | 1/QTY. |
|----------|----------------------------------|----------------|------------------------------------|----------------------------------------------|--------|
| 1        | SK93F-225M                       | SK93-225M      | NORD GEARBOX                       | CI-BLUE RDL5015                              | 1      |
| 2        |                                  | J431-A-45KW-10 | IMPELLER DIA 1548mm (BLADE TH=8mm) | PAINT - MS EPOXY - CARBOLINE 891 - PIPE BLUE | 1      |
| 3        |                                  | J431-A-45KW-06 | SHAFT ASSEMBLY 1351mm              | PAINT - MS EPOXY - CARBOLINE 891 - PIPE BLUE | 1      |
| 4        |                                  | J431-A-45KW-18 | MOTOR SHAFT COUPLING               | PAINT - MS EPOXY - CARBOLINE 891 - PIPE BLUE | 1      |
| 5        |                                  | J431-A-45KW-24 | SPACER                             | PAINT - MS EPOXY - CARBOLINE 891 - PIPE BLUE | 1      |
| 6        |                                  | J431-A-45KW-23 | COUPLING DISK                      | PAINT - MS EPOXY - CARBOLINE 891 - PIPE BLUE | 1      |
| 8        |                                  | J431-A-45KW-17 | MOUNTING PLATE                     | HDG                                          | 8      |
| 12       |                                  | J431-A-45KW-15 | MOTOR BASE PLATE                   | HDG + ORGANIC COATING                        | 1      |
| 13       | Hexagon Nut ISO - 4034 - M48 - N |                |                                    | HDG                                          | 20     |
| 17       | DIN 976-1 -- M48 x 500 A-- N     |                |                                    | HDG                                          | 4      |
| 18       | Washer DIN 126 - 52              |                |                                    | HDG                                          | 12     |

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|                   |                    |          | DRAWING ISSUED FOR |                     |
|                   |                    |          | TENDER             |                     |
| 1<br>Rev          | 31.10.2025<br>Date | EM<br>by | ISSUED FOR TENDER  | Description         |
| Revision Schedule |                    |          |                    | COPY RIGHT RESERVED |

|        |                                                                                       |
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|            |                                                                                                                                                                                                                                                                                                                |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONSULTANT | <br><b>MUTEO CONSULTING</b><br>UNIT A3, CENTURION CLOSE<br>119 GERHARD STREET<br>CENTURION<br>0157 GAUTENG, SOUTH AFRICA<br>TEL: 012 664 6577<br>FAX: 012 664 4875<br>Email: mail@muteo.co.za<br>Website: www.muteo.co.za |
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|             |                                                                                       |
|-------------|---------------------------------------------------------------------------------------|
| APPROVED BY | M.M.                                                                                  |
| DESIGNED BY | A.N.                                                                                  |
| DRAWN BY    | E.M.                                                                                  |
| DATE        | 2025.10.31                                                                            |
| ECISA       | 201901008                                                                             |
| SIGNATURE   |  |

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|----------------------------------------------|--------------|------------|----|
| Project                                      |              |            |    |
| TSWELOPELE SEWER PUMP STATION REFURBISHMENTS |              |            |    |
| SCALE                                        | As indicated | SHEET SIZE | A0 |
| DRAWING NUMBER<br>PR00545_1-ME-801-WTWWW     |              |            |    |

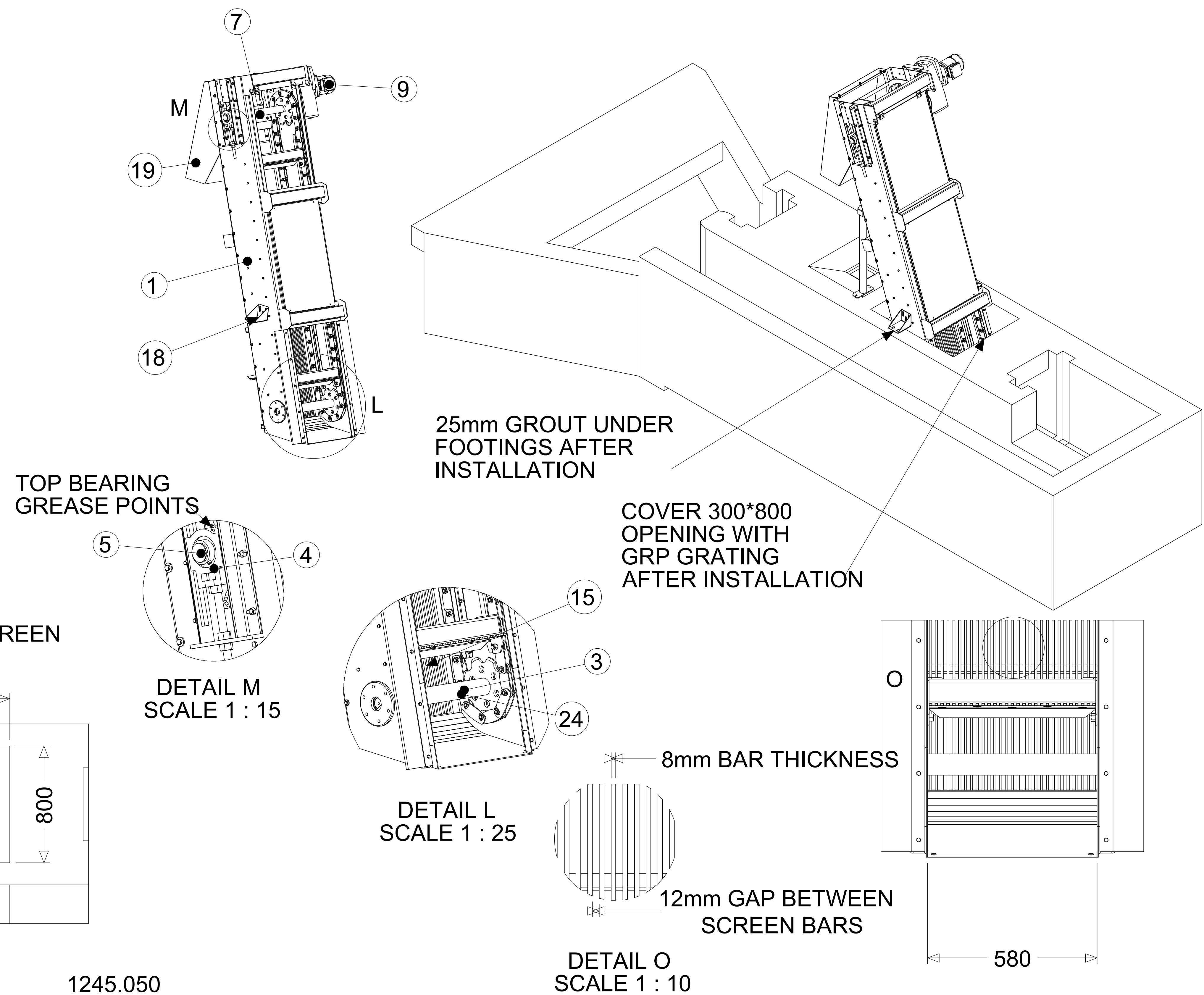
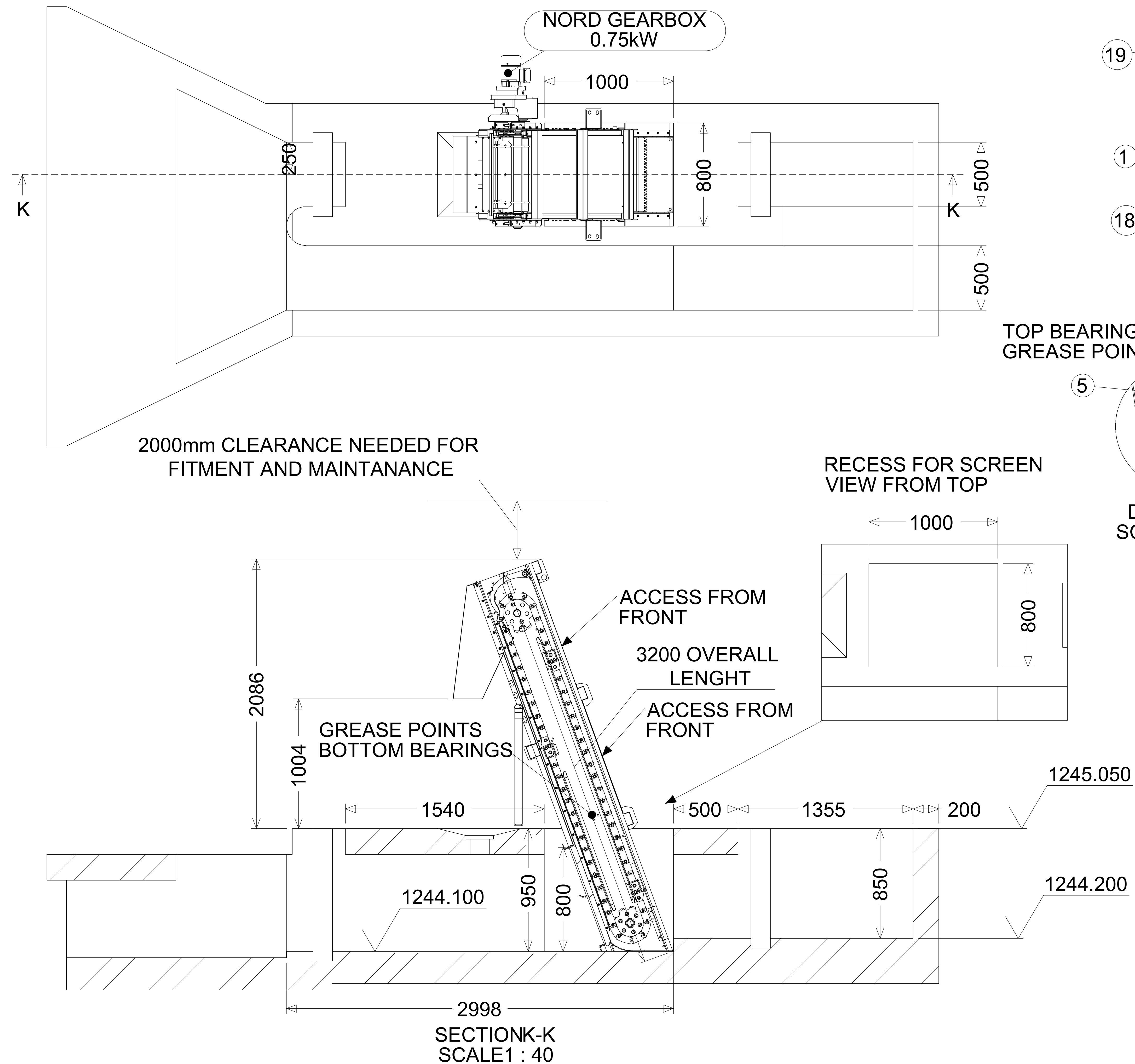
|             |                                   |
|-------------|-----------------------------------|
| Discipline  | MECHANICAL ENGINEERING            |
| Description | AERATOR 45kW GENERAL INSTALLATION |







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| ITEM NO. | PART NUMBER     | DESCRIPTION                   | QTY. |
|----------|-----------------|-------------------------------|------|
| 1        | FRS-01-00       | FRS BODY ASSY                 | 1    |
| 2        | FRS-08-00       | MOTOR SIDE BRNG HOUSING BRKT  | 1    |
| 3        | FRS-02-00       | SCREEN BOTTOM SPROCKET ASSY   | 1    |
| 4        | UCT210J         | Y-BEARING TAKE -UP            | 2    |
| 5        | FRS-03-00       | SCREEN TOP SHAFT ASSY         | 1    |
| 7        | FRS-05-00       | SCREEN SCRAPER ASSY           | 1    |
| 9        | 3D_SK4382A-80L4 | GEARBOX                       | 1    |
| 15       | FRS-00-06       | SCREEN BAR                    | 29   |
| 18       | FRS-06-00       | FRS SIDE MOUNT BRACKET DETAIL | 2    |
| 19       | FRS-07-00       | OUTLET SHUTE ASSY             | 1    |
| 24       | FRS-04-00       | CHAIN ASSY                    | 1    |

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[illegible]