DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

TENDER DOCUMENT

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

PREPARED BY:
The Municipal Manager
DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY
Private Bag X9011
VOLKSRUST, 2470

Tel: +27 (0) 17 734 6100
Fax: +27 (0) 86 630 2209

NAME OF TENDERER: ……...

SUPPLIER NO AS PER CSD:……

TENDER AMOUNT (INCL.VAT@15%):……..

CLOSING DATE: WEDNESDAY , 31 AUGUST 2022 AT 12:00

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

CLOSING DATE AND TIME: WEDNESDAY , 31 AUGUST 2022 at 12:00

Tenders are hereby invited from Local SMME's, emerging contractors and co-operatives to submit bids for the **T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.**

Tenderers should have a minimum CIDB contractor grading of 4ME or higher.

Tender documents will be obtainable on **WEDNESDAY , 17 AUGUST 2022** from 10H00am at the Finance Department (Volksrust Offices) upon payment of a non-refundable tender levy of R497.00 or may be downloadable free of charge from www.etenders.gov.za. Only bank guaranteed cheques or cash will be accepted. The compulsory briefing session will be held as per the abovementioned dates at the municipal offices in Volksrust and tenderers are expected to meet the Municipal representatives punctually as indicated. Failure to attend will result in a bidder not being considered.

Duly completed tenders must be sealed in an envelope clearly marked: **"MUNICIPAL MANAGER, DR PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY, T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.**

CLOSING DATE: **WEDNESDAY , 31 AUGUST 2022** AT 12H00 must be placed in the tender box at Dr Pixley Ka Seme Local Municipality offices, c/o Adelaide Tambo Street & Dr Nelson Mandela Drive in Volksrust not later than **WEDNESDAY , 31 AUGUST 2022** when tenders will be opened in public.

Late tenders, incomplete tender documents and tenders per email or fax will not be accepted and the Dr Pixley Ka Isaka Seme Local Municipality does not bind itself to accept the lowest or any tender. Dr Pixley Ka Isaka Seme Local Municipality reserves itself the right to accept a tender as a whole or in part.
All administrative enquiries can be directed to Mrs N Khuzwayo at 017 734 6187 and the technical enquiries can be directed to Mr. B.H. Buthelezi.

MR. N.T. MOKAKO
MUNICIPAL MANAGER (ACTING) **NOTICE NO: 70/2022**

Contents

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

T1.2 Bid Data

The conditions of Bid are the Standard Conditions of Bid as contained in Annex F of the CIDB Standard for Uniformity in Construction Procurement. (See www.cidb.org.za) which are reproduced without amendment or alteration for the convenience of Bidders as an Annex to this Bid Data

The Standard Conditions of Bid make several references to the Bid Data for details that apply specifically to this Bid. The Bid Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of Bid. Each item of data given below is cross-referenced to the clause in the Standard Conditions of Bid to which it mainly applies.

The additional conditions of Bid are:

Clause number	Bid Data
F.1.1	The employer is the DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY**.**
F.1.2	The Bid documents issued by the employer comprise: T1.1 Bid notice and invitation to Bid T1.2 Bid data T2.1 List of returnable documents T2.2 Returnable schedules **Part 1: Agreements and contract data** C1.1 Form of offer and acceptance C1.2 Contract data C1.3 Form of Guarantee C1.4 Adjudicator's appointment **Part 2: Pricing data** C2.1 Pricing instructions C2.2 Activity schedules / Bills of Quantities **Part 3: Scope of work** C3 Scope of work **Part 4: Site information** C4 Site information
F.1.4	The employer's details are: Name: **Dr. Pixley Ka Isaka Seme Local Municipality** Address: **c/o Adelaide Tambo & Dr. Nelson Mandela Drive Volksrust, 2470** Tel: 017 734 6100 Fax: 086 630 2209 E-mail: records@pixleykaseme.gov.za
F.2.1	Only those Bidders who have in their employ management and supervisory staff satisfying the requirements of the Scope of Work for labour intensive competencies for supervisory and management staff are eligible to submit Bids.

Standard Conditions of Bid

(As contained in Annexure F of the CIDB Standard for Uniformity in Construction Procurement)

F.1 General

F.1.1 Actions

The employer and each Bidder submitting a Bid offer shall comply with these conditions of Bid. 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 Bid Documents

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

F.1.3 Interpretation

F.1.3.1 The Bid data and additional requirements contained in the Bid schedules that are included in the returnable documents are deemed to be part of these conditions of Bid.

F.1.3.2 These conditions of Bid, the Bid data and Bid schedules which are only required for Bid evaluation purposes, shall not form part of any contract arising from the invitation to Bid.

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 Bidder's financial offer after the factors of non-firm prices, all unconditional discounts and any other Bided 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 Bid process; and
c) **fraudulent practice** means the misrepresentation of the facts in order to influence the Bid process or the award of a contract arising from a Bid 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.1.4 Communication and employer's agent

Each communication between the employer and a Bidder shall be to or from the employer's agent only, and in a form that can be read, copied and recorded. Writing shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a Bidder. The name and contact details of the employer's agent are stated in the Bid data.

F.1.5 The employer's right to accept or reject any Bid offer

F.1.5.1 The employer may accept or reject any variation, deviation, Bid offer, or alternative Bid offer, and may cancel the Bid process and reject all Bid offers at any time before the formation of a contract. The employer shall not accept or incur any liability to a Bidder for such cancellation and rejection, but will give written 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 Bid process or the rejection of all responsive Bid offers re-issue a Bid covering substantially the same scope of work within a period of six months unless only one Bid was received and such Bid was returned unopened to the Bidder.

F.2 Bidder's obligations

F.2.1 Eligibility

Submit a Bid offer only if the Bidder complies with the criteria stated in the Bid data and the Bidder, or any of his principals, is not under any restriction to do business with employer.

F.2.2 Cost of Biding

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

F.2.3 Check documents

Check the Bid 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 Bid. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a Bid offer in response to the invitation.

F.2.5 Reference documents

Obtain, as necessary for submitting a Bid 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 Bid documents by reference.

F.2.6 Acknowledge addenda

Acknowledge receipt of addenda to the Bid documents, which the employer may issue, and if necessary, apply for an extension to the closing time stated in the Bid data, in order to take the addenda into account.

F.2.7 Clarification meeting

Attend **compulsory a clarification meeting** at which Bidders may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the Bid data.

F.2.8 Seek clarification

Request clarification of the Bid documents, if necessary, by notifying the employer at least five working days before the closing time stated in the Bid 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 Bidder is advised to seek qualified advice regarding insurance.

F.2.10 Pricing the Bid offer

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

F2.10.2 Show VAT payable by the employer separately as an addition to the Bided 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 Bid 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 Bid documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the Bidder. All signatories to the Bid offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited.

F.2.12 Alternative Bid offers

F.2.12.1 Submit alternative Bid offers only if a main Bid offer, strictly in accordance with all the requirements of the Bid documents, is also submitted. The alternative Bid offer is to be submitted with the main Bid offer together with a schedule that compares the requirements of the Bid documents with the alternative requirements the Bidder proposes.

F.2.12.2 Accept that an alternative Bid offer may be based only on the criteria stated in the Bid data or criteria otherwise acceptable to the employer.

F.2.13 Submitting a Bid offer

F.2.13.1 Submit a Bid offer to provide the whole of the works, services or supply identified in the contract data and described in the scope of works, unless stated otherwise in the Bid 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 Bid offer communicated on paper as an original plus the number of copies stated in the Bid 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 Bid offer where required in terms of the Bid data. The employer will hold all authorized signatories liable on behalf of the Bidder. Signatories for Bidders 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 Bid offer.

F.2.13.5 Seal the original and each copy of the Bid offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the Bid data, as well as the Bidder’s name and contact address.

F.2.13.6 Where a two-envelope system is required in terms of the Bid data, place and seal the returnable documents listed in the Bid 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 Bid data, as well as the Bidder’s name and contact address.

F.2.13.7 Seal the original Bid offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the Bid data.

F.2.13.8 Accept that the employer shall not assume any responsibility for the misplacement or premature opening of the Bid 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 Bid 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 Bid offer at the address specified in the Bid data not later than **12h00 on Wednesday, 31 August 2022** as stated in the Bid data. Proof of posting shall not be accepted as proof of delivery. The employer shall not accept Bid offers submitted by telegraph, telex, facsimile or e-mail, unless stated otherwise in the Bid data.

F.2.15.2 Accept that, if the employer extends the closing time stated in the Bid data for any reason, the requirements of these conditions of Bid apply equally to the extended deadline.

F.2.16 Bid offer validity

F.2.16.1 Hold the Bid offer(s) valid for acceptance by the employer at any time during the validity period stated in the Bid data after the closing time stated in the Bid data.

F.2.16.2 If requested by the employer, consider extending the validity period stated in the Bid data for an agreed additional period.

F.2.17 Clarification of Bid offer after submission

Provide clarification of a Bid offer in response to a request to do so from the employer during the evaluation of Bid 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 Bid offer is sought, offered, or permitted. The total of the prices stated by the Bidder shall be binding upon the Bidder.

Note: Sub-clause F.2.17 does not preclude the negotiation of the final terms of the contract with a preferred Bidder following a competitive selection process, should the Employer elect to do so.

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 Bid offer, the Bidder's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment. Should the Bidder 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 Bid 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 Bid 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 Bid documents

If so, instructed by the employer, return all retained Bid documents within 28 days after the expiry of the validity period stated in the Bid data.

F.2.23 Certificates

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

F.3 The employer's undertakings

F.3.1 Respond to clarification

Respond to a request for clarification received up to five working days prior to the Bid closing time stated in the Bid Data and notify all Bidders who drew procurement documents.

F.3.2 Issue Addenda

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

F.3.3 Return late Bid offers

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

F.3.4 Opening of Bid submissions

F.3.4.1 Unless the two-envelope system is to be followed, open valid Bid submissions in the presence of Bidders' agents who choose to attend at the time and place stated in the Bid data. Bid submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

F.3.4.2 Announce at the opening held immediately after the opening of Bid submissions, at a venue indicated in the Bid data, the name of each Bidder whose Bid offer is opened, the total of his prices, preferences claimed and time for completion, if any, for the main Bid offer only.

F.3.4.3 Make available the record outlined in F.3.4.2 to all interested persons upon request.

F.3.5 Two-envelope system

F.3.5.1 Where stated in the Bid data that a two-envelope system is to be followed, open only the technical proposal of valid Bids in the presence of Bidders' agents who choose to attend at the time and place stated in the Bid data and announce the name of each Bidder whose technical proposal is opened.

F.3.5.2 Evaluate the quality of the technical proposals offered by Bidders, then advise Bidders 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 Bidders, who score in the quality evaluation above the minimum number of points for quality stated in the Bid data, and announce the score obtained for the technical proposals and the total price and any preferences claimed. Return unopened financial proposals to Bidders whose technical proposals failed to achieve the minimum number of points for quality.

F.3.6 Non-disclosure

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

F.3.7 Grounds for rejection and disqualification

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

F.3.8 Test for responsiveness

Determine, on opening and before detailed evaluation, whether each Bid offer properly received:

a) meets the requirements of these Conditions of Bid,
b) has been properly and fully completed and signed, and
c) is responsive to the other requirements of the Bid documents.

A responsive Bid is one that conforms to all the terms, conditions, and specifications of the Bid documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

- detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- change the Employer's or the Bidder's risks and responsibilities under the contract, or
- affect the competitive position of other Bidders presenting responsive Bids, if it were to be rectified.

Reject a non-responsive Bid 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

Check responsive Bid offers for arithmetical errors, correcting them in the following manner:

- Where there is a discrepancy between the amounts in figures and in words, the amount in words shall govern.
- If a bill of quantities (or schedule of rates) 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 will be corrected.
- 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 Bidder's addition of prices, the total of the prices shall govern and the Bidder will be asked to revise selected item prices (and their rates if a bills of quantities applies) to achieve the Bided total of the prices.

Consider the rejection of a Bid offer if the Bidder does not correct or accept the correction of his arithmetical errors in the manner described above.

F.3.10 Clarification of a Bid offer

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

F.3.11 Evaluation of Bid offers

F3.11.1 General

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

Method 1: Financial offer	1) Rank Bid offers from the most favorable to the least favorable comparative offer. 2) Recommend highest ranked Bidder for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 2: Financial offer and preferences	1) Score Bid evaluation points for financial offer.
	2) Confirm that Bidders are eligible for the preferences claimed and if so, score Bid evaluation points for preferencing. 3) Calculate total Bid evaluation points. 4) Rank Bid offers from the highest number of Bid evaluation points to the lowest. 5) Recommend Bidder with the highest number of Bid evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.

Method 3: Financial offer and quality	1) Score quality, rejecting all Bid offers that fail to score the minimum number of points for quality stated in the Bid data. 2) Score Bid evaluation points for financial offer. 3) Calculate total Bid evaluation points. 4) Rank Bid offers from the highest number of Bid evaluation points to the lowest. 5) Recommend Bidder with the highest number of Bid evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 4: Financial offer, quality and preferences	1) Score quality, rejecting all Bid offers that fail to score the minimum number of points for quality stated in the Bid data. 2) Score Bid evaluation points for financial offer. 3) Confirm that Bidders are eligible for the preferences claimed, and if so, score Bid evaluation points for preferencing. 4) Calculate total Bid evaluation points. 5) Rank Bid offers from the highest number of Bid evaluation points to the lowest. 6) Recommend Bidder with the highest number of Bid evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so. .

EVALUATION CRITERIA

Responsive bids will be evaluated in two stages as follows:

Stage 1: Functionality

Bidders who score less than 60% (39 points) on Stage 1 will not be evaluated further. Only bidders who score 60% (39 points) or more will be evaluated further and therefore eligible for the award of the contract.

Functionality points shall be awarded in accordance with the following provisions:

CRITERIA		**WEIGHTING**
Previous WTW Refurbishment projects		**Maximum 20 points**
4 Previous completed WTW Refurbishment projects Copies of appointment should be attached to claim points	5 points each	
Technical Expertise and Competency		**Maximum 15 Points**
Contractor's key personnel (contract manager) experience in WTW projects More than five years Two to Five Years Less Than Two Years No experience	 15 points 10 points 5 point 0 Point	
Available plant		**Maximum 15 Points**
Proof of Plant and equipment ownership where owned by the Tender and/or where plant will be hired out to the tender attach an original letter indicating so.		
Machine Owned LDV Compactor (Wakker) Machine Hired LDV Compactor (Wakker)	 10 points 5 points 5 points 3 points	**15 Points** **8 Points**	
LOCALITY		**Maximum 15 Points**
Points for locality will be allocated based on the following jurisdiction: Within Dr Pixley Ka Isaka Seme Local Municipality's jurisdiction Within Gert Sibande District Within Mpumalanga Province	 15 Points 10 Points 5 Points	
TOTAL POINTS FOR FUNCTIONALITY		**MAXIMUM 65 POINTS**

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

T2.1 List of Returnable Documents

The Bidder must complete the following returnable documents:

1 Returnable Schedules required only for Bid evaluation purposes

- Certificate of authority for joint ventures (where applicable)
- Compulsory Enterprise Questionnaire
- Record of Addenda to Bid Documents
- Proposed Amendments and Qualifications
- Schedule of Subcontractors
- Schedule of Plant and Equipment
- Schedule of the Bidder's Experience
- Municipal statement on Bidder's rates and taxes

2 Other documents required only for Bid evaluation purposes

- completed tender documents;
- a company profile;
- a copy of company registration certificate;
- certified ID copies of the company's shareholders, members, trustees, etc
- a valid tax clearance certificate and a compliant tax status;
- a proposed construction / works programme;
- letter confirming a signatory of authority
- minimum CIDB registration certificate (4ME or higher)
- an original B-BBEE certificate or a certified copy;
- Signed JV agreement in case of a JV
- Municipal Statement for municipal Services or a signed lease agreement if leasing a property

3 Returnable Schedules that will be incorporated into the contract

- Preferencing Schedule (direct preferences)

4 Other documents that will be incorporated into the contract

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

6 C1.2 Contract Data (Part 2)

7 C2.2 Bills of quantities

Record of Addenda to Bid documents

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

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

Attach additional pages if more space is required.

Signed		Date	
Name		Position	
Bidder			

Certificate of Authority for Joint Ventures

This Returnable Schedule is to be completed by joint ventures.

We, the undersigned, are submitting this Bid 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 Bid offer and any contract resulting from it on our behalf.

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

Schedule of Proposed Subcontractors

We notify you that it is our intention to employ the following Subcontractors for work in this contract.

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

We confirm that all subcontractors who are contracted to construct a house are registered as home builders with the National Home Builders Registration Council.

	Name and address of proposed Subcontractor	**Nature and extent of work**	**Previous experience with Subcontractor.**
1.			
2.			
3.			
4.			
5.			

Signed		Date	
Name		Position	
Bidder			

Schedule of Plant and Equipment

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

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

Signed		Date	
Name		Position	
Bidder			

Schedule of the Bidder's Experience

The following is a statement of similar work successfully executed by myself/ourselves:

Employer, contact person and telephone number.	Description of contract	Value of work inclusive of VAT (Rand)	Date completed

Signed		Date	
Name		Position	
Bidder			

Proposed amendments and qualifications

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

The Bidder's attention is drawn to clause F.3.8 of the Standard Conditions of Bid referenced in the Bid Data regarding the employer's handling of material deviations and qualifications.

Page	Clause or item	Proposal

Signed		Date	
Name		Position	
Bidder			

MBD 1

PART A
INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE DR PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY					
TENDER NO	**12/2022**	CLOSING DATE:	**31 August 2022**	CLOSING TIME:	**12:00**
DESCRIPTION	**T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.**				
THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (MBD7).					

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX
SITUATED AT

Dr Pixley ka Isaka Seme Local Municipality Offices (Entrance Foyer)
Cnr Adelaide Tambo Street and Dr Nelson Mandela Drive
Volksrust
2470

SUPPLIER INFORMATION					
NAME OF BIDDER					
POSTAL ADDRESS					
STREET ADDRESS					
TELEPHONE NUMBER	CODE		NUMBER		
CELLPHONE NUMBER					
FACSIMILE NUMBER	CODE		NUMBER		
E-MAIL ADDRESS					
VAT REGISTRATION NUMBER					
TAX COMPLIANCE STATUS	TCS PIN:		**OR**	CSD No:	
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE [TICK APPLICABLE BOX]	☐ Yes ☐ No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT	☐ Yes ☐ No	

[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSEs) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]

ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐Yes ☐No [IF YES ENCLOSE PROOF]	ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?	☐Yes ☐No [IF YES, ANSWER PART B:3]
TOTAL NUMBER OF ITEMS OFFERED		TOTAL BID PRICE	**R**
SIGNATURE OF BIDDER	.....	DATE	
CAPACITY UNDER WHICH THIS BID IS SIGNED			

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO:		**TECHNICAL INFORMATION MAY BE DIRECTED TO:**	
DEPARTMENT	**Supply Chain**	CONTACT PERSON	**Mr. B.H. Buthelezi**
CONTACT PERSON	**Ms. N. Khuzwayo**	TELEPHONE NUMBER	**017 734 6187**
TELEPHONE NUMBER	**017 734 6163**	FACSIMILE NUMBER	**086 6302209**
FACSIMILE NUMBER	**086 6302209**	E-MAIL ADDRESS	**buthelezib@pixleykaseme.gov.za**
E-MAIL ADDRESS	**mpumek@pixleykaseme.gov.za**		

PART B
TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:

1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.

1.2. **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED–(NOT TO BE RE-TYPED) OR ONLINE**

1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.

2. TAX COMPLIANCE REQUIREMENTS

2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.

2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYER'S PROFILE AND TAX STATUS.

2.3 APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION, TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA.

2.4 FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PART B:3.

2.5 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.

2.6 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.

2.7 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.

3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS

3.1.	IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
3.2.	DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
3.3.	DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO
3.4.	DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO
3.5.	IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO

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

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

SIGNATURE OF BIDDER: ……

CAPACITY UNDER WHICH THIS BID IS SIGNED: ……

DATE: ……..

TAX CLEARANCE CERTFICATE REQUIREMENTS

It is a condition of bid that the taxes of the successful bidder must be in order, or that satisfactory arrangements have been made with South African Revenue Service (SARS) to meet the bidder's tax obligations.

1. In order to meet this requirement bidders are required to complete in full the attached form TCC 001 "Application for a Tax Clearance Certificate" and submit it to any SARS branch office nationally. The Tax Clearance Certificate Requirements are also applicable to foreign bidders / individuals who wish to submit bids.

2. SARS will then furnish the bidder with a Tax Clearance Certificate that will be valid for a period of 1 (one) year from the date of approval.

3. The original Tax Clearance Certificate must be submitted together with the bid. Failure to submit the original and valid Tax Clearance Certificate will result in the invalidation of the bid. Certified copies of the Tax Clearance Certificate will not be acceptable.

4. In bids where Consortia / Joint Ventures / Sub-contractors are involved, each party must submit a separate Tax Clearance Certificate.

5. Copies of the TCC 001 "Application for a Tax Clearance Certificate" form are available from any SARS branch office nationally or on the website www.sars.gov.za.

6. Applications for the Tax Clearance Certificates may also be made via e-Filing. In order to use this provision, taxpayers will need to register with SARS as eFilers through the website www.sars.gov.za.

MBD 4

DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state*.
2. Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the bidder or their authorised representative declare their position in relation to the evaluating/adjudicating authority and/or take an oath declaring his/her interest.

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

3.1 Full Name: ……

3.2 Identity Number: ……

3.3 Company Registration Number: ……

3.4 Tax Reference Number: ……

3.5 VAT Registration Number: ……

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

3.6.1 If so, furnish particulars.

……

……

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

3.7.1 If so, furnish particulars.

***** MSCM Regulations: "in the service of the state" means to be –

(a) a member of –
  (i) any municipal council;
  (ii) any provincial legislature; or
  (iii) the national Assembly or the national Council of provinces;

(b) a member of the board of directors of any municipal entity;
(c) an official of any municipality or municipal entity;
(d) an employee of any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999);
(e) a member of the accounting authority of any national or provincial public entity; or
(f) an employee of Parliament or a provincial legislature.

……

……

3.8 Do you, have any relationship (family, friend, other) with persons in the service of the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

3.8.1 If so, furnish particulars.

……

……

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

3.9.1 If so, furnish particulars.

……

……

3.10 Are any of the company's directors, managers, principal shareholders or stakeholders in service of the state? **YES / NO**

3.9.1 If so, furnish particulars.

……

……

3.11 Are any spouse, child or parent of the company's directors, managers, principle shareholders or stakeholders in service of the state? **YES / NO**

3.11.1 If so, furnish particulars.

……

CERTIFICATION

I, THE UNDERSIGNED (NAME) ……..……

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

I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD 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 2017

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, 2017.

---

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 not exceed R50 000 000 (all applicable taxes included) and therefore the **80/20** preference point system shall be applicable; or

b) Either the 80/20 preference point system will be applicable to this tender.

1.3 Points for this bid shall be awarded for:

(a) Price; and

(b) B-BBEE Status Level of Contributor.

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

	POINTS
PRICE	80
B-BBEE STATUS LEVEL OF CONTRIBUTOR	20
Total points for Price and B-BBEE must not exceed	**100**

1.5 Failure on the part of a bidder to submit proof of B-BBEE Status level of contributor together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.

1.6 The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the purchaser

2. DEFINITIONS

(a) **"B-BBEE"** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;

(b) "**B-BBEE status level of contributor"** means the B-BBEE status of an entity in terms of a code of good practice on black economic empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;

(c) **"bid"** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the provision of goods or services, through price quotations, advertised competitive bidding processes or proposals;

(d) **"Broad-Based Black Economic Empowerment Act"** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);

(e) **"EME"** means an Exempted Micro Enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

(f) **"functionality"** means the ability of a tenderer to provide goods or services in accordance with specifications as set out in the tender documents.

(g) **"prices"** includes all applicable taxes less all unconditional discounts;

(h) **"proof of B-BBEE status level of contributor"** means:

1) B-BBEE Status level certificate issued by an authorized body or person;

2) A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;

3) Any other requirement prescribed in terms of the B-BBEE Act;

(i) **"QSE"** means a qualifying small business enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

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

3. POINTS AWARDED FOR PRICE

3.1 THE 80/20 PREFERENCE POINT SYSTEMS

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

80/20

$$Ps = 80\left(1 - \frac{Pt - P\min}{P\min}\right)$$

Where

Ps = Points scored for price of bid under consideration

Pt = Price of bid under consideration

Pmin = Price of lowest acceptable bid

4. POINTS AWARDED FOR B-BBEE STATUS LEVEL OF CONTRIBUTOR

4.1 In terms of Regulation 6 (2) and 7 (2) of the Preferential Procurement Regulations, preference points must be awarded to a bidder for attaining the B-BBEE status level of contribution in accordance with the table below:

B-BBEE Status Level of Contributor	Number of points (90/10 system)	Number of points (80/20 system)
1	10	20
2	9	18
3	6	14
4	5	12
5	4	8
6	3	6
7	2	4
8	1	2
Non-compliant contributor	0	0

5. BID DECLARATION

5.1 Bidders who claim points in respect of B-BBEE Status Level of Contribution must complete the following:

6. B-BBEE STATUS LEVEL OF CONTRIBUTOR CLAIMED IN TERMS OF PARAGRAPHS 1.4 AND 4.1

6.1 B-BBEE Status Level of Contributor: . = ……(maximum of 20 points)

(Points claimed in respect of paragraph 7.1 must be in accordance with the table reflected in paragraph 4.1 and must be substantiated by relevant proof of B-BBEE status level of contributor.

7. SUB-CONTRACTING

7.1 Will any portion of the contract be sub-contracted?

(***Tick applicable box***)

YES		NO	

7.1.1 If yes, indicate:

i) What percentage of the contract will be subcontracted.....……%
ii) The name of the sub-contractor……
iii) The B-BBEE status level of the sub-contractor.....……

iv) Whether the sub-contractor is an EME or QSE
(Tick applicable box)

YES		NO	

v) Specify, by ticking the appropriate box, if subcontracting with an enterprise in terms of Preferential Procurement Regulations,2017:

Designated Group: An EME or QSE which is at last 51% owned by:	**EME √**	**QSE √**
Black people		
Black people who are youth		
Black people who are women		
Black people with disabilities		
Black people living in rural or underdeveloped areas or townships		
Cooperative owned by black people		
Black people who are military veterans		
OR		
Any EME		
Any QSE		

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 contributor 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 paragraphs 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 BIDDERS(S) DATE: …….. ADDRESS …….. …….. ……..

MBD 7.2

CONTRACT FORM - RENDERING OF SERVICES

THIS FORM MUST BE FILLED IN DUPLICATE BY BOTH THE SERVICE PROVIDER (PART 1) AND THE PURCHASER (PART 2). BOTH FORMS MUST BE SIGNED IN THE ORIGINAL SO THAT THE SERVICE PROVIDER AND THE PURCHASER WOULD BE IN POSSESSION OF ORIGINALLY SIGNED CONTRACTS FOR THEIR RESPECTIVE RECORDS.

PART 1 (TO BE FILLED IN BY THE SERVICE PROVIDER)

1. I hereby undertake to render services described in the attached bidding documents to (name of the institution)…… in accordance with the requirements and task directives / proposals specifications stipulated in Bid Number…….. at the price/s quoted. My offer/s remains binding upon me and open for acceptance by the Purchaser during the validity period indicated and calculated from the closing date of the bid.

2. The following documents shall be deemed to form and be read and construed as part of this agreement:

   (i) Bidding documents, *viz*
   - Invitation to bid;
   - Tax clearance certificate;
   - Pricing schedule(s);
   - Filled in task directive/proposal;
   - Preference claims for Broad Based Black Economic Empowerment Status Level of Contribution in terms of the Preferential Procurement Regulations 2011;
   - Declaration of interest;
   - Declaration of Bidder's past SCM practices;
   - Certificate of Independent Bid Determination;
   - Special Conditions of Contract;

   (ii) General Conditions of Contract; and
   (iii) Other (specify)

3. I confirm that I have satisfied myself as to the correctness and validity of my bid; that the price(s) and rate(s) quoted cover all the services specified in the bidding documents; that the price(s) and rate(s) cover all my obligations and I accept that any mistakes regarding price(s) and rate(s) and calculations will be at my own risk.

4. I accept full responsibility for the proper execution and fulfilment of all obligations and conditions devolving on me under this agreement as the principal liable for the due fulfillment of this contract.

5. I declare that I have no participation in any collusive practices with any bidder or any other person regarding this or any other bid.

6. I confirm that I am duly authorised to sign this contract.

NAME (PRINT) …….

CAPACITY …….

SIGNATURE …….

NAME OF FIRM …….

WITNESSES

1 ……..

2 ……..

DATE: ……..

CONTRACT FORM - RENDERING OF SERVICES

PART 1 (TO BE FILLED IN BY THE PURCHASER /THE MUNICIPALITY)

1. I……..…….. in my capacity as ……..…… accept your bid under reference number …… dated …… for the rendering of services indicated hereunder and/or further specified in the annexure(s).

2. An official order indicating service delivery instructions is forthcoming.

3. I undertake to make payment for the services rendered in accordance with the terms and conditions of the contract, within 30 (thirty) days after receipt of an invoice.

DESCRIPTION OF SERVICE	PRICE (ALL APPLICABLE TAXES INCLUDED)	COMPLETION DATE	B-BBEE STATUS LEVEL OF CONTRIBUTION	MINIMUM THRESHOLD FOR LOCAL PRODUCTION AND CONTENT (if applicable)

4. I confirm that I am duly authorised to sign this contract.

SIGNED AT …… ON …….....

NAME (PRINT) …….

SIGNATURE ……

OFFICIAL STAMP

WITNESSES
1 …..…….
2 …..…….
DATE: ……..

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 municipalities and municipal entities 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 rejected if that bidder, or any of its directors have:

   a) abused the municipality's / municipal entity's supply chain management system or committed any improper conduct in relation to such system;
   b) been convicted for fraud or corruption during the past five years;
   c) willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
   d) been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).

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?** **(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 *audi alteram partem* rule was applied).** **The Database of Restricted Suppliers now resides on the National Treasury's website (www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
4.1.1	If so, furnish particulars:		

Item	Question	Yes	No
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)? **The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
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 of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐
4.3.1	If so, furnish particulars:		
4.4	Does the bidder or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?	Yes ☐	No ☐
4.4.1	If so, furnish particulars:		
4.5	Was any contract between the bidder and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
4.7.1	If so, furnish particulars:		

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME) ……..……..…… CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM 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**

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

1. This Municipal Bidding Document (MBD) must form part of all bids 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).[2] Collusive bidding is a *pe se* prohibition meaning that it cannot be justified under any grounds.

3. Municipal Supply Regulation 38(1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to:

   a. take all reasonable steps to prevent such abuse;

   b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and

   c. cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the 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:

[1] Includes price quotations, advertised competitive bids, limited bids and proposals.

[2] 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 Municipality / Municipal Entity)

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;

   (b) could potentially submit a bid in response to this bid invitation, based on 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[3] 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 bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

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

[3] 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.

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

PROPOSED SUBCONTRACTION WORK (30% of the project to be subcontracted to local contractors)

The following work or projects will be subcontracted to local contractors for this project and is not limited to the following:

Project1: _____

Project2: _____

Project3: _____

Project4: _____

Project5: _____

Project6: _____

Project7: _____

…….. ……

Signature Date

…….. …….

Position Name of Bidder

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

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:

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

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

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

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

. . . . Rand (in words);

R . . . . (in figures)

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

Signature . . . . Date . . . .

Name . . . .

Capacity . . . .

for the Bidder
(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 Bidder'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 Bidder's offer shall form an agreement between the employer and the Bidder 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

and drawings and documents or parts thereof, which may be incorporated by reference into Parts 1 to 4 above.

Deviations from and amendments to the documents listed in the Bid data and any addenda thereto as listed in the Bid schedules as well as any changes to the terms of the offer agreed by the Bidder 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 Bidder 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 fulfill any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the Bidder receives one fully completed original copy of this document, including the schedule of deviations (if any). Unless the Bidder (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

THE MUNICIPAL MANAGER
DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY
Private Bag X9011
VOLKSRUST
2470

Name and signature of witness . . . . . .

Date . . . . . .

. . . . . .

Schedule of Deviations

1 Subject . . . . . .

Details . . . . . .

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2 Subject . . . . . .

Details . . . . . .

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3 Subject . . . . . .

Details . . . . . .

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4 Subject . . . . . .

Details . . . . . .

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5 Subject . . . . . .

Details . . . . . .

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By the duly authorised representatives signing this agreement, the employer and the Bidder agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the Bid data and addenda thereto as listed in the Bid schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the Bidder 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 Bid documents and the receipt by the Bidder of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

C1.2 Contract Data

The General Conditions of Contract for Construction Works (2015) published by the South African Institution of Civil Engineering, is applicable to this contract Drawings. Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering (tel 011-805 5947).

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

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

	The variations to the General Conditions of Contract are:
4.5.2	Replace the term “Safety” with “Occupational Health and Safety”
49.6.1 to 4.9.6.3	Replace the term “Bank” with “Bank or Insurance Company”
55.1.8	Replace sub-clause with: The Contractor or anyone on his behalf or in his employ would pay, offer or offer as payment to any person in the employ of the Employer, or in the employ of the Engineer, a gratuity or reward or commission.
42	**The additional clauses to the General Conditions of Contract are:** Extensions of time in respect of clause 42 in respect of abnormal rainfall shall be calculated using the following formula for each calendar month or part thereof: $V = (Nw – Nn) + \frac{(Rw – Rn)}{X}$ Where: V = Extension of time in calendar days in respect of the calendar month under consideration. Nw = Actual number of days during the calendar month on which a rainfall of 10 mm or more has been recorded. Nn = Average number of days in the relevant calendar month , as derived from existing rainfall records, as stated in the Site Information, on which a rainfall of 20mm or more has been recorded for the calendar month. Rw = Actual average rainfall in mm recorded for the calendar month under consideration. Rn = Average rainfall in mm for the calendar month as derived from existing rainfall records as stated in the Site Information. For purposes of the Contract Nn, Rn, X and Y shall have those values assigned to them in the Appendix and/or the Specification. If V is negative and its absolute value exceeds Nn, then V shall be taken as equal to minus Nn.

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

Extensions of time for part of a month shall be calculated using pro rata values of Nn and Rn. This formula does not take account flood damage which could cause further or concurrent delays and will be treated separately as far as extension of time is concerned.

The factor (Nw – Nn) shall be considered to represent a fair allowance for variations from the average in the number of days during which rainfall exceeds 10 mm. The factor (Rw-Rn) shall be considered to represent a fair allowance for variations from the average in the number of days during which the rainfall did not exceed 10 mm but wet conditions prevented or disrupted work.

For the purpose of applying the formula, accurate rain gauging shall be taken at a suitable point on the Site and the Contractor shall at his own expense, take all necessary precautions to ensure that rain gauges cannot be interfered with by unauthorized persons.

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, Special 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 a Special Public Works Programme (SPWP). These terms and conditions do NOT apply to persons employed in the supervision and management of a SPWP.
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 a SPWP;
(c) “worker” means any person working in an elementary occupation on a SPWP;
(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 SPWP;
(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 a SPWP 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 a EPWP.
2.3 Employment on a SPWP 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 SPWP 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 SPWP;
(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 SPWP.

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 SPWP.

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;
(c) 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
(f) 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 SPWP; (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 SPWP 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 SPWP on which the worker worked; (d) the work performed by the worker; (e) any training received by the worker as part of the SPWP; (f) the period for which the worker worked on the SPWP; (g) any other information agreed on by the employer and worker.

Part 1: Contract Data completed by the Employer

Clause	
1.1.14	The name of the Employer is the: DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY
1.2.2	The address of the Employer is: Telephone: 017 734 6100

	Fax : 086 630 2209 Address (physical): DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY, Address (postal): P. Bag X9011, VOLKSRUST, 2470
1.1.15 1.2.2	The official representing the employer (Client) Mr. L B Tshabalala Municipal Manager
1.6 and 38	The special non-working days are public holidays, Saturdays, Sundays and the days on which the contractor grants the majority of his permanent workforce leave around the 16th December and the first Monday of the subsequent year.
2.3	The Engineer is required to obtain the specific approval of the Employer before executing any of the following functions or duties: 1. Nominating the Engineer's Representative in terms of Clause 2.4. 2. Delegation of Engineer's authority in terms of Clause 2.7. 3. Providing consent for subcontracting part of the contract in terms of Clause 6.2. 4. The issuing of further drawings or instructions in terms of Clause 13.1 5. The issuing of instructions for dealing with fossils and the like in terms of Clause 15. 6. Authorizing the Contractor to repair and make good excepted risks in terms of Clause 32.2.2. 7. The issuing of a variation order in terms of Clause 36.2. 8. Issuing of instructions to carry out work on a day work basis in terms of Clause 37.1.4. 9. Granting permission to work during non-working times in terms of Clause 38.1. 10. Suspend the progress of the works in terms of Clause 39.1. 11. The issuing of an instruction to accelerate progress in terms of Clause 40.3. 12. The reduction of a penalty for delay in terms of Clause 43.2. 10. The determination of additional or reduced costs arising from changes in legislation in terms of Clause 46.4. 11. The giving of a ruling on a contractor's claim in terms of Clause 48.5. 12. The agreeing of an extension to the 28 period in terms of Clause 48.5.1. 13. The inclusion of credits in the next payment certificate in terms of Clause 48.5.2. 14. The agreeing of the adjustment of the sums for general items in terms of Clause 50.1.
7	The time to deliver the Form of Guarantee within 14 days of the Commencement Date. The Form of Guarantee is to contain the wording of the document included in Clause.3. The liability for the guarantee shall be for **10% of the contract amount.**
10	The Works are to be commenced within **14 days** of the Appointment Date.
12.2	The Works programme is to be delivered within **14 days** of the Commencement Date.
35.1.1.2.2	The value of the materials supplied by the Employer to be included in the insurance sum is **R0-00**
35.1.1.2.3	The amount to cover professional fees for repair or reinstatement of damage to the works to be included in the insurance sum is **R0-00**
35.1.3	The limit of liability insurance is **10% of the contract amount** per claim.
35.1.4	No additional insurance is required.
37.2.2.3	The percentage allowance to cover overhead charges is **15%**.
42.1 1.1.13	The works shall be completed within **three (06) months** exclusive of year end break.
43.1	The penalty for failing to complete the Works is **1.5% of the contract amount per month.**
46.2	The value of the payment certificates is to be adjusted in accordance with the Contract Price Adjustment Schedule, where: The value of "x" is 0,15 a = 0.15 (labour) b = 0.20 (plant)

	c = 0.55 (materials) d = 0.10 (fuel) The urban area nearest the site is Volksrust.
49.1.5	The percentage advance on materials not yet built into the Permanent Works is 80%
49.3	The percentage retention on amounts due to the Contractor is **10% of the contract amount.**
49.6	A Retention Money Guarantee is **permitted**.
53.1	The Defects Liability Period is **12 months**.
58.2	Dispute resolution is to be my means of adjudication
58.4	Disputes are to be referred for final settlement to arbitration.

Part 2: Data provided by the Contractor

Clause	
1.8 1.2.2	The name of the Contractor is. . . . . . The address of the contractor is: Telephone: . . . . . . Facsimile: . . . . . . Address (physical): . . . . Address (postal): . . . .
46.3	The variation in cost of special materials is:

Special material	**Unit on which variation will be determined**		**Price for base month ex factory, excluding transport, labour or any other costs.**
	Containers	Delivered in bulk	

*State unit in appropriate column

C1.3 Form of Guarantee

Contract No: …… Description
……

WHEREAS **The DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY** (hereinafter referred to as the Employer") entered into, a Contract with:

. . . . . .
. . .

(hereinafter called "the Contactor") on the . . . . . day of . . . . . .20. . . .
. . .,

AND WHEREAS it is provided by such Contract that the Contractor shall provide the Employer with security by way of a guarantee for the due and faithful fulfillment of such Contract by the Contractor;

AND WHEREAS . . . . . has / have at the
request of the Contractor, agreed to give such guarantee;

NOW THEREFORE WE . . . . . do hereby
guarantee and bind ourselves jointly and severally as Guarantor and Co-principal Debtors to the Employer under renunciation of the benefits of division and excussion for the due and faithful performance by the Contractor of all the terms and conditions of the said Contract, subject to the following conditions:

1. The Employer shall, without reference and / or notice to us, have complete liberty of action to act in any manner authorized and/or contemplated by the terms of the said Contract, and/or to agree to any modifications, variations, alterations, directions or extensions of the completion date of the works under the said Contract, and that its rights under this guarantee shall in no way be prejudiced nor our liability hereunder be affected by reason of any steps which the Employer may take under such Contract, or of any modification, variation, alterations of the completion date which the Employer may make, give, concede or agree to under the said Contract.

2. This guarantee shall be limited to the payment of a sum of money.

3. The Employer shall be entitled, without reference to us, to release any guarantee held by it, and to give time to or compound or make any other arrangement with the Contractor.

4. This guarantee shall remain in full force and effect until the issue of the Certificate of Completion in terms of the Contract, unless we are advised in writing by the Employer before the issue of the said Certificate of his intention to institute claims, and the particulars thereof, in which event this guarantee shall remain in full force and effect until all such claims have been paid or liquidated.

5. Our total liability hereunder shall not exceed the Guaranteed Sum of . . . . . .
   . . . . . .Rand (in words); R . . . . . .
   . . . . . (in figures) ……

6. The Guarantor reserves the right to withdraw from this guarantee by depositing the Guaranteed Sum with the beneficiary, whereupon our liability hereunder shall cease.

7. We hereby choose our address for the serving of all notices for all purposes arising here from as

. . . . . .

. . .

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. . .

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. . . . . .

. . .

IN WITNESS WHEREOF this guarantee has been executed by us at . . . . . .
. . .
on this . . . . . day of . . . . . 20 . . . . . .

Signature . . . . . .

Duly authorized to sign on behalf of . . . . . .
. . .

Address . . . . . .

. . . . . .
. . .

. . . . . .
. . .

As witnesses:

1 . . . . . .

2 . . . . . .

C2.1 Pricing Instructions

1 Measurement and payment shall be in accordance with the relevant provisions of clause 8 of each of the SABS 1200 Standardised Specifications for Civil Engineering Construction referred to in the Scope of Work. The Preliminary and General items shall be measured in accordance with the provisions of SABS 1200-A, *General.*

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

%	=	percent
h	=	hour
ha	=	hectare
kg	=	kilogram
kl	=	kilolitre
km	=	kilometre
km-pass	=	kilometre-pass
kPa	=	kilopascal
kW	=	kilowatt
l	=	litre
m	=	metre
mm	=	millimetre
m^2	=	square metre
m^2-pass	=	square metre-pass
m^3	=	cubic metre
m^3-km	=	cubic metre-kilometre
MN	=	meganewton
MN.m	=	meganewton-metre
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. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.

4. The prices and rates in these Bills 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 work 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.

5 It will be assumed that prices included in these Bills 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 Bids. (Refer to www.stanza.org.za or www.iso.org for information on standards)

6 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 amount Bided such items

7. An item against which no price is entered will be considered to be covered by the other prices or rates in the Bills of Quantities. A single lump sum will apply should a number of items be grouped together for pricing purposes.

8. The quantities set out in these Bills 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 Bills of Quantities.

9. Reasonable compensation will be received where no pay item appears in respect of work required in the Bills of Quantities in terms of the Contract and which is not covered in any other pay item.

10. The short descriptions of the items of payment given in these Bills 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. Descriptions in the Bills of Quantities are abbreviated and comply generally with those in the SABS 1200 Standardised Specifications.

12. Those parts of the contract to be constructed using labour-intensive methods have been identified in the scope of works. **Tenderers must price such works so as to allow for Labour-intensive construction methods**. 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.

13. **Payment for items which are designated to be constructed labour-intensively 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

Amersfoort WTW Refurbishment Phase 2
PRELIMINARY AND GENERAL

SECTION : GENERAL (SMALL WORKS)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
1	SANS 1200 AA	SECTION : PRELIMINARY AND GENERAL					
1.1		Fixed charges					
1.1.1	8.3.1	Contractual Requirements	Sum	1.0			
1.1.2	8.3.2	Facilities required by Engineer	Sum	1.0			
1.1.3		Facilities required by Contractor	Sum	1.0			
1.1.4	8.3.3	General responsibilities and other fixed-charge obligations	Sum	1.0			
1.1.5	8.3.4	Removal of Site establishment on completion	Sum	1.0			
1.1.6		Maintenance on all new mechanical installations as per BOQ Section (MECHANICAL PHASE 1) for a period of 12 months	Sum	1.0			
1.2		Time-related charges (for duration of contract, unless otherwise stated)					
1.2.1	8.4.1	Contractual requirements	Sum	1.0			
1.2.2	8.4.2	Facilities for Engineer	Sum	1.0			
1.2.3		Facilities for Contractor	Sum	1.0			
1.2.4	8.4.3	General responsibilities and other time related obligations	Sum	1.0			
Total Carried Forward To Summary							

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT (RAND)
1	PRELIMINARY AND GENERAL	.....
Total Carried Forward To Summary Of Schedules		

Amersfoort WTW Refurbishment Phase 2
MECHANICAL PHASE 1

BUILDING A

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
200		SECTION: BUILDING A					
		Rates to include supply, transport, store, install and commission u.o.n					
		Raw Water Pump					
200.1		Supply,install and commission raw water pump Q=268m³hr H= 26m KSB double entry centrifugal pump OMEGA 125-290A Serial number 9972324125010001 or equivalent complete with base plate and a 30kW electric motor	No.	1.0			
200.2		Service 2 tonne Hoist and issue certificate	Sum	1.0			
200.3		Provision of New Tier for the main MCC	Prov Sum			R365 000	00
		Handling cost of the above item	%				
Total Carried Forward To Summary							

Amersfoort WTW Refurbishment Phase 2
MECHANICAL PHASE 1

BUILDING B

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
201		SECTION: BUILDING B					
		Amersfoor Pump Station					
201.1		Serivce clean water pump Krloskar RKB Horizontal Multistage PumpModel RKB 125/30.6 Pump No.129181970013 Serial No K75115A008/1120 Q = 216m³/hr H=170m or equivalent complete with base plate and a 150kW electric motor	No.	2.0			
		Daggakraal Pump Station					
201.2		Supply,install and commission clean water pump KSB centrifugal pump Type WKln 125/3 Model 9971007699/100 Q= 265m³/hr H=88m or equivalent complete with base plate and a 75kW electric motor	No.	2.0			
201.3		Service pipe manifolds and valves and issue pressure test certificate	Sum	1.0			
		Perdekop Pump Station					
201.4		Service clean water pump Grundfos Multistage Pump Type CR64-6A-F-A-E-HQQE Serial No-B96534658P11513 or equivalent complete with base plate and a 37 kW electric motor	No.	2.0			
201.5		Replace 37 kW electric motor	No.	1.0			
		Floculant Dosing					
201.6		Replace floculant dosing pump Q 80l/m H/50m Power 1kW 3 phase 230/400V 50HZ complete with electric motor and base plate	Sum	1.0			
		Coagulant					
201.7		Service coagaulant dosing pumps	Sum	4.0			
		Chlorine Dosing					
201.8		Replace the 30mm solonoid valve	No.	1.0			
201.9		Service the chlorine dosing system	No.	1.0			
201.10		Replace worn out chlorine dosing system	No.	1.0			
201.11		Service 2 tonne Hoist and issue certificate	No.	1.0			
Total Carried Forward To Summary							

Amersfoort WTW Refurbishment Phase 2
MECHANICAL PHASE 1

BUILDING F

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
203		SECTION: BUILDING F					
		Drying Beds					
203.1		Service pipe line (30m)	Sum	1.0			
		Perdekop Valve Chambers					
203.2		Dewater the valve chamber	Sum	1.0			
203.3		Repair Leaking piepes and valves	Sum	1.0			
Total Carried Forward To Summary							

Amersfoort WTW Refurbishment Phase 2
MECHANICAL PHASE 1

ADDITIONAL REQUIREMENTS BY MUNICIPALITY

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
204		SECTION: ADDITIONAL REQUIREMENTS BY MUNICIPALITY					
		Rates to include supply, transport, store, install and commission u.o.n					
204.1		FLOW METERS					
204.1.1		Replacement of the Perdekop outflow meter with similar approved	No.	1.0			
204.1.2		Replacement of the Daggakraal outflow meter with similar approved	No.	1.0			
204.1.3		Replacement of the Amersfoort outflow meter with similar approved	No.	1.0			
204.2		RAW WATER METER					
204.2.1		Recalibrate and adjust raw water meter at abstraction building	No.	1.0			
204.2.2		Totaliser fro outflow before split junction (Min 6ML/day)	No.	1.0			
		OPERATIONAL MONITORING EQUIPMENT (4.6ML/Day Plant)					
204.2.3		Jar Test Stand	No.	1.0			
204.2.4		Conductivity Meter	No.	1.0			
204.2.5		Turbidity Meter	No.	1.0			
204.2.6		PH Meter	No.	1.0			
204.2.7		Chlorine Meter	No.	1.0			
Total Carried Forward To Summary							

Amersfoort WTW Refurbishment Phase 2
MECHANICAL PHASE 1

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT (RAND)
200	BUILDING A	.....
201	BUILDING B	.....
202	BUILDING F	.....
204	ADDITIONAL REQUIREMENTS BY MUNICIPALITY	.....
Total Carried Forward To Summary Of Schedules		

SUMMARY OF SCHEDULES

SCHEDULE	DESCRIPTION	AMOUNT (RAND)
1	PRELIMINARY AND GENERAL	.....
2	MECHANICAL PHASE 1	.....
	SUBTOTAL	.....
1	Add 15% VAT	.....
Total		

…….
SIGNATURE(S) OF BIDDERS(S)

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

C3. Scope of Work

1 DESCRIPTION OF THE WORKS

1.1 Employer's objectives

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

1.3 Extent of the works

Mechanical Scope of Works
Building A
Building B
Building F

Is as follows:

- ***Refurbishment of sand filters inclusive of nozzles, pipes and filter media.***
- ***Refurbishment of backwash system including replacement of backwash submersible pumps.***
- ***Refurbishment of Air Saturation System including replacement of blowers and compressors.***
- ***Replacing and servicing of pumps and motors***

1.4 Labour-Intensive Works

All the works shall be constructed using Labour-Intensive Construction Methods wherever is possible.

1.5 Temporary works

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 3m in size with a desk and 10 chairs is to be provided for the purpose of holding site meetings.

3 PROCUREMENT

3.1 Preferential procurement procedures

The works shall be executed in accordance with the conditions attached to preferences granted in accordance with the preferencing schedule.

3.2 Scope of mandatory subcontract work

The following portions of the works shall be subcontracted to CIDB registered contractors in accordance with the subcontracting procedures described hereunder:

Competitive Bids shall be invited in respect of each of the above portions of the works in accordance with the relevant provisions of the latest edition of the CIDB Standard for Uniformity in Construction Procurement. The Contract Data in the associated procurement documents shall be based on the use of BIFSA Non-Nominated Subcontract for use with the JBCC Series 2000 Principal Building Agreement / CIDB Standard subcontract (labour only) / JBCC series 2000 Nominated / Selected Subcontract Agreement / SAFCEC General conditions of subcontract (2003 edition) (select appropriate option) / NEC Engineering and Construction

Subcontract / NEC Engineering and Construction Short Subcontract with minimal project specific variations and amendments that do not change their intended usage.

The Employer together with the Contractor shall evaluate the Bids received in accordance with the provisions of the Standard Conditions of Bid contained in Annex F of Standard for Uniformity in Construction Procurement. The evaluation panel shall comprise equal representatives from the Employer and from the Contractor.
The Contractor shall without delay enter into contract with the successful Biding subcontractor based on their accepted Bid submission. The Contractor shall remain responsible for providing the subcontracted portion of the works as if the work had not been subcontracted.

4 Construction

Setting out of Works (Subclause 5.1.1)

The contractor together with the beneficiary of the toilet shall arrange the preferable position of the toilet taking in it account the distance from and too the household. ”

4.1 Applicable national and international standards

- SANS 1200

4.2 Particular / generic specifications

The relevant provisions of the SANS 1200 (1981 edition) shall apply to the contract with the following amendments:

1115 Replace clause with the following:

The general conditions of contract are the General Conditions of Contract for Construction Works (2004) as published by the South African Institution of Civil Engineering read in conjunction with the Contract Data.

1202 Replace “Clause 15” with “Clause 12”.

1206 Replace the first sentence with the following:

The contractor shall comply with all legal provisions in regard to surveying and setting out work.

1209(e) Replace “Clause 52” with “Clauses 29 and 49.2”.

1210 Replace “Clause 54” with “Clause 51”.

1212(1) Replace “Clause 49” with “Clause 46”.

1215 Replace “Clause 45” with “Clause 42”.

1217 Replace “Clause 35” with “Clause 31”.

1303 Replace “Clauses 49 and 53” with “Clause 50”.

13.01(3) Replace “Clauses 12 and 45” with “Clauses 1.1.4 and 42”.

14.03(c) Replace “Clause 40(1)” with “Clause 37”.

1505 Replace “Clauses 40 and 53” with “Clause 37”.

3204(b)(iii) Replace “Clauses 40 and 53” with “Clause 37”.

4.3. EPWP labour intensive specification

4.3.1 Labour intensive competencies of supervisory and management staff

Contractors having a CIDB contractor grading designation of **3CEPE** and higher shall only engage supervisory and management staff in labour intensive works who have either completed, or for the period 1 April 2004 to 30 June 2006, are registered for training towards, the skills programme outlined in Table 1.

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

Table 1: Skills programme for supervisory and management staff

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

4.3.2 Employment of unskilled and semi-skilled workers in labour-intensive works

4.3.2.1 Requirements for the sourcing and engagement of labour.

4.3.2.1.1 Unskilled and semi-skilled labour required for the execution of all labour intensive works shall be engaged strictly in accordance with prevailing legislation and SANS 1914-5, Participation of Targeted Labour.

4.3.2.1.2 The rate of pay set for the EPWP is R 180 per task or per day.

4.3.2.1.3 Tasks established by the contractor must be such that:

a) the average worker completes 5 tasks per week in 40 hours or less; and
b) the weakest worker completes 5 tasks per week in 55 hours or less.

4.3.2.1.4 The contractor must revise the time taken to complete a task whenever it is established that the time taken to complete a weekly task is not within the requirements of 4.3.2.1.3.

4.3.2.1.5 The Contractor shall, through all available community structures, inform the local community of the labour intensive works and the employment opportunities presented thereby. Preference must be given to people with previous practical experience in construction and / or who come from households:

a) where the head of the household has less than a primary school education;
b) that have less than one full time person earning an income;
c) where subsistence agriculture is the source of income.
d) those who are not in receipt of any social security pension income

4.3.2.1.6 The Contractor shall endeavour to ensure that the expenditure on the employment of temporary workers is in the following proportions:

a) 60 % women;
b) 20% youth who are between the ages of 18 and 25; and
c) 2% on persons with disabilities.

4.3.2.2 Specific provisions pertaining to SANS 1914-5

4.3.2.2.1 Definitions

Targeted labour: Unemployed persons who are employed as local labour on the project.

4.3.2.2.2 Contract participation goals

4.3.2.2.2.1There is no specified contract participation goal for the contract. The contract participation goal shall be measured in the performance of the contract to enable the employment provided to targeted labour to be quantified.

4.3.2.2.2.2 The wages and allowances used to calculate the contract participation goal shall, with respect to both time-rated and task rated workers, comprise all wages paid and any training allowance paid in respect of agreed training programmes.

4.3.2.2.3 Terms and conditions for the engagement of targeted labour

Further to the provisions of clause 3.3.2 of SANS 1914-5, written contracts shall be entered into with targeted labour.

4.3.2.2.2.4 Variations to SANS 1914-5

4.3.2.2.2.4.1The definition for net amount shall be amended as follows:

Financial value of the contract upon completion, exclusive of any value added tax or sales tax which the law requires the employer to pay the contractor.

4.3.2.2.2.4.2 The schedule referred to in 5.2 shall in addition reflect the status of targeted labour as women, youth and persons with disabilities and the number of days of formal training provided to targeted labour.

4.3.2.2.2.5 Training of targeted labour

4.3.2.2.2.5.1The contractor shall provide all the necessary on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract in a manner that does not compromise worker health and safety.

4.3.2.2.2.5.2 The cost of the formal training of targeted labour, will be funded by the provincial office of the Department of Labour. This training should take place as close to the project site as practically possible. The contractor, must access this training by informing the relevant provincial office of the Department of Labour in writing, within 14 days of being awarded the contract, of the likely number of persons that will undergo training and when such training is required. The employer must be furnished with a copy of this request.

4.3.2.2.2.5.3 A copy of this training request made by the contractor to the DOL provincial office must also be faxed to the EPWP Training Director in the Department of Public Works– Cinderella Makunike, Fax Number 012 328 6820 or email cinderella.makunike@dpw.gov.za Tel: 083 677 4026.

4.3.2.2.2.5.4 The contractor shall be responsible for scheduling the training of workers and shall take all reasonable steps to ensure that each beneficiary is provided with a minimum of six (6) days of formal training if he/she is employed for 3 months or less and a minimum of ten (10) days if he she is employed for 4 months or more.

4.3.2.2.2.5.5 The contractor shall do nothing to dissuade targeted labour from participating in training programmes.

4…2.2.2.5.4 An allowance equal to 100% of the task rate or daily rate shall be paid by the contractor to workers who attend formal training, in terms of 4.3.2.2.2.5.4 above.

4.3.2.2.2.5.5 Proof of compliance with the requirements of 4.3.2.2.2.5.2 to 4.3.2.2.2.5.6 must be provided by the Contractor to the Employer prior to submission of the final payment certificate.

4.4 Plant and equipment

Add Subclause 4.4: Restriction on the use of plant.

"Except for the type of plant, and to the extent permitted in terms of the project specification or approved by the Engineer, in writing, the Contractor shall use only hand tools and equipment in the construction of the Works, or portion(s) of the Works, that are required in terms of the project specification to be constructed using labour intensive methods.
Failure by the Contractor to adhere to this clause will put him in breach of contract. The provisions contained in this contract with regard to labour content and labour intensive construction, are binding, and will be enforced accordingly."
The plant and equipment used on the site shall not be inferior to that described in the Schedule of Plant and Equipment.

5 Management

5.1 Applicable SANS 1921 standards

The following parts of SANS 1921 Construction works standards and associated specification data are applicable to the works:

1) SANS 1921-1:2004
2) SANS 1921-2:2004
3) SANS 1921-6:2004

The abovementioned South African National Standards make several references to the Specification Data for data, provisions and variations that make these standards applicable to this contract. The Specification Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and these standards.

Each item of Specification Data given below is cross-referenced to the clause in the standard to which it mainly applies.

The associated Specification Data is as follows:

SANS 1921-1, Construction and management requirements for works contracts – Part 1: General engineering and construction works	
Clause	**Specification data**
Essential data	

4.1.7	There are no requirements for drawings, information and calculations for which the contractor is responsible
4.2.1	The responsibility strategy assigned to the contractor for the works is A.
4.3.1	The planning, programme and method statements are to comply with the following: 1)Microsoft projects programme 2)Detailed method statements 3)Milestone dates for completion State requirements for format of programme, level of detail, critical path activities and their dependencies, frequency of updating, etc., if not provided in the contract data. Provide particulars of phased completion, programme constraints, milestone dates for completion, etc., as necessary. State requirements for sequencing, as required. State any requirements for software for programmes.
4.3.3	The notice period for inspection is 24 hrs
4.7.3	The over break allowances for blasting are provided for in the scope of work.
4.9.3	The trees and shrubs which are not to be disturbed are identified in the scope of work.
4.12.2	The samples of materials, workmanship and finishes that the contractor is to provide and deliver to the employer.
4.14.3	The office accommodation, equipment, accommodation for site meetings and other facilities for use by the employer and his agents are: 1) **Site office** which shall be used for site meetings and for the contractor's use. Such an office shall comprise a minimum of $20m^2$ in area and 3 m high, be ventilated, have good lamination, must be reasonably sound proof, and have a hard floor construction. It shall be furnished with a desk on which drawings can be rolled open and on which there is sufficient writing space and sufficient temporary chairs or benches to accommodate all persons present at site meetings.
4.14.5	The Contractor is required to provide latrine and ablution facilities.
4.14.6	The requirements for the provision and erection of separate sign boards for consultants and subcontractors are: 1) The boards must comply with the official standard type signboard of the Employer and be at least 2750 x 1800 mm high. 2) The boards must be constructed with a firm flat exposed face using suitable material of firm construction, painted and lettered according to the standard drawings available from the Employer on request and mounted on sturdy pipe-standards at a height of 1800 mm above natural ground level.
4.17.1	The requirements for the termination, diversion or maintenance of existing services are: 1) Water 2) Electricity 3) Sanitation
4.17.3	Services which are known to exist on the site are: 1) Water 2) Sanitation 3) Electricity
4.17.4	Requirements for detection apparatus.
Variations	

Additional clauses

1 **Site meetings and procedures**

The Employer's Representative and the Contractor shall hold meetings relating to the progress of the works at regular intervals and at other such times as may be necessary. The Contractor shall attend all site meetings and shall ensure that all persons under his jurisdiction are notified timeously of all site meetings should the Employer's Representative require their attendance at such meetings.

The Contractor shall keep on site a set of minutes of all site meetings, daily records of resources (people and equipment employed), a site instruction book, a complete set of contract working drawings and a copy of the procurement document and make these available at all reasonable times to all persons concerned with the contract.

Water: The Contractor is to provide, and remove and make good upon completion, all the necessary temporary plumbing connections and purchase water from the local authority for the works at his own cost.

Electricity: The Contractor is to provide, and remove and make good upon completion, all the necessary temporary electrical connections and installations and purchase electricity form the local authority / ESKOM for the works at his own cost.

5.2 Particular / generic specifications

The management of the site shall be in accordance with the provisions of the COLTO Standard Specification for Road and Bridge Works for State Authorities (1998 edition), obtainable from the South African Institution of Civil Engineering.

5.3 Recording of weather

The Contractor shall erect an effective rainfall gauge on the site and record the daily rainfall figures in a book. Such book shall be handed to the employer's representative for his signature no later than 12 days after rain that is considered to justify an extension of time occurs.

5.4 Unauthorized persons

The Contractor shall keep unauthorized persons from the works at all times Under no circumstances may any person except guards be allowed to sleep on the building site.

5.5 Management meetings

Site meetings will be held on monthly basis. The following parties are required to attend these meetings: the Employer's Representative, the Engineer and/or Representative, the Contractor and/or Representative, the Community Liaison Officer, the Health and Safety Officer and all members of the Project Steering Committee.

5.6 Forms for contract administration
5.7 Electronic payments

5.8 Daily records

All accidents and incidents shall be recorded daily in a site diary. Apart from the site diary the Contractor shall provide a site instruction notebook for use by the Engineer. The notebook shall be signed by both the Engineer and the Contractor whenever a site instruction is issued by the Engineer.

5.9 Payment certificates

Contractor to submit claims for the work done. All claims are subjected to verification by the Engineer.

5.10 Permits

Contractor to ensure that no unauthorized persons are permitted to site.

5.11 Proof of compliance with the law

Contractor to submit copies of the CIDB Registration and the Company Registration Certificates.

DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY

T12/2022: APPOINTMENT OF A CONTRACTOR FOR REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS.

C4. Site Information

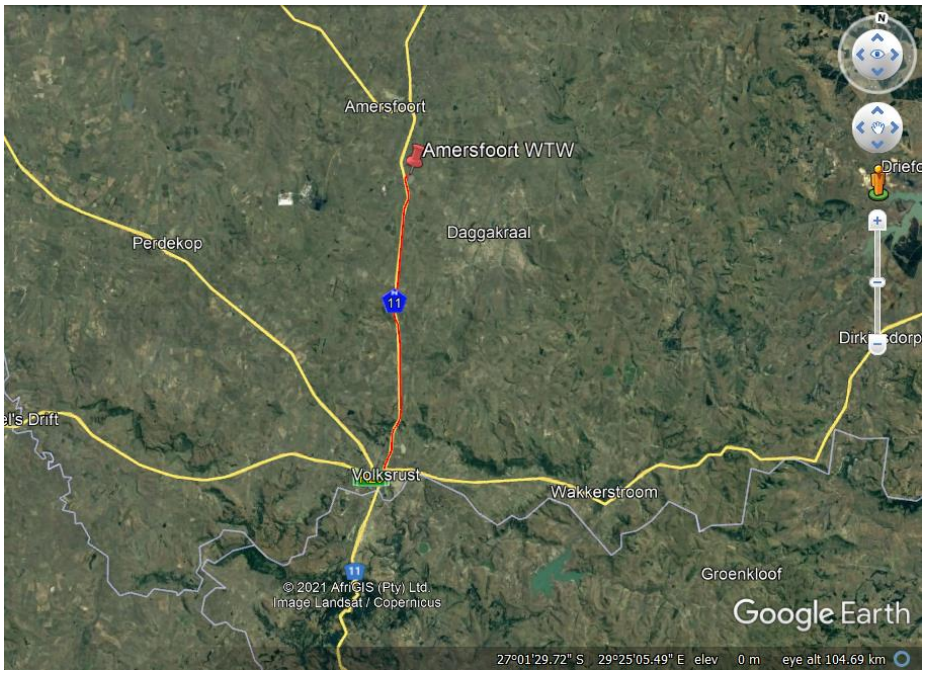
Site Inspection

The tenderer shall inform him/ herself on the nature of the site and inspect the site.

The Employer will consider a tender only if the site inspection and/or tenderer's meeting arranged by the Engineer has been attended by a representative who must:

- Be suitably qualified to comprehend the implications of the work involved and
- Be the tenderer him/herself or a person in the direct employ of the tenderer

Locality Maps for Amersfoort WTW




© 2021 AfriGIS (Pty) Ltd.
Image © 2021 Maxar Technologies
Google Earth
Imagery Date: 5/27/2021 27°04'16.68" S 29°52'41.06" E elev 0 m eye alt 394 m

Key Plan

A	Intake
B	Pump Stations
C	Coagulation/Flocculation Basin
D	Sedimentation Basin
E	Rapid Gravity Sand Filter
F	Drying Beds

ANNEXURE A

SCHEDULE OF PERSONNEL AND EMPLOYEES

The Tenderer shall state below the number of Personnel and Employees to be employed on the Works.

PERSONNEL AND EMPLOYEES	**TENDER**			**TENDER**
	FULL TIME	**PART TIME**	**FULL TIME**	**PART TIME**
1. Technical staff				
2. Clerical staff				
3. Artisans				
4. Semi-skilled				
5. Unskilled labour				
Total				

State the name, qualifications and experience of permanent Site agent:

Date: ……

SIGNATURE OF TENDERER: ……..

ANNEXURE B

PRELIMINARY PROGRAMME

The Tenderer shall detail below or attach a preliminary programme reflecting the proposed order and rate of progress for each portion of the work comprising this Contract. The programme shall be consistent with and in support of his time required for completion and shall be in accordance with the requirements of this tender.

PROGRAMME												
ACTIVITY	**WEEKS / MONTHS**											

SIGNATURE OF TENDERER; ……..

ANNEXURE C

SITE INSPECTION CERTIFICATE

This is to certify that I,
……

representing and duly authorized by (Tenderer) ……

……..

attended the site inspection on

……

Having prior to this site visit carefully examined the tender document, technical information and drawings supplied, I confirm that I was given unrestricted access to inspect those sections of the Site necessary for the execution of the Works.

I further confirm that I am completely satisfied with the scope of work as explained by the Engineer, and am fully aware of all Site conditions and regulations of whatsoever nature that could influence the preparation of our tender.

I therefore append my signature below in agreement that we will not institute any claim against the Employer after submission of our tender based on lack of knowledge of site conditions or regulations appertaining to the execution of this Contract.

_____ _____
Signature of Tenderer's Representative Date

_____ _____
Signature of Representative of the Municipality Date

ANNEXURE D

FINANCIAL DETAILS, STATEMENTS AND BANK REFERENCES

1. FINANCIAL STATEMENTS

I/We agree, if required, to furnish a copy of the latest audited set of financial statement together with my/our Director's and Auditor's report for consideration by the DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY.

2. DETAILS OF CONTRACTOR'S BANK ACCOUNT

I/We furnish the following information:

a) Account Holder Name:……..
b) Name of Bank:……
c) Branch of Bank: …….
d) Town/city/suburb where bank is situated:…….
e) Contact Person at the Bank:……
f) Telephone number of Bank: Code: ……. Number: ……..
g) Account Number:……..
h) Bank rating (include confirmation from bank or financial institution):……

I/We hereby authorise the Employer to approach the above Bank for a reference.

SIGNED ON BEHALF OF THE TENDERER:……

DATE: ……

ANNEXURE E

4. SPECIAL CONDITIONS OF CONTRACT

The following Special Conditions of Contract (SCC) shall apply to this contract and the Employer undertakes that the only variations from the General Conditions of Contract are as follows:

SCC 1 Clause 1(1)(1) **"Employer "** means **DR. PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY** Herein represented by their Nominee.

SCC 2 Clause 1(1) m **"Engineer"** means the Employer's representative.

SCC 3 Clause 14 **Survey References**

The following sub-clause is added at the end of Clause 14(3) and is numbered 14(4):
"The Contractor shall take adequate precautions to preserve any permanent beacons such as erf boundary pegs, reference marks and bench marks which may be present on or in the vicinity on the site, irrespective of whether any such beacon may have been placed before or during the construction period. "Should any such beacon be distributed by any act or omission on the part of the Contractor or any officer, servant, agent or invitee of the Contractor then the Contractor shall arrange for the displaced beacon to be replaced by a registered land surveyor within such limits of time as the Engineer may prescribe and all costs, charges and expenses arising from such replacement shall be borne by the Contractor.
"Survey diagrams relating to the replacement of beacons in the circumstances described in the previous paragraph shall be submitted by the land surveyor concerned to the Director for Works of the Mpumalanga Department of Works for approval. IN this regard, attention is drawn to Clause 35(1) of the Survey Act No. 9 of 1927 (as amended)."

SCC 4 Clause (1) **Drawings and Documents**

The following shall be added to this Sub-Clause:
Upon receipt of the final payment in respect of the Contract, the Contractor shall forthwith return to the Employer's name. "None of the documents herein before mentioned shall be used by either of the parties hereto for any purpose other than the performance of their respective obligations under the Contractor. "Drawings supplied to the Contractor by the Employer or Engineer, or supplied by the Contractor and approved of by the Engineer or Employer shall not be departed from without the written instructions of the Engineer or Employer. "All dimensions will be figures on the drawings and are to be considered correct even if not to scale. No dimension shall be obtained by scaling."

SCC 5 Clause 24 **Competent employees**

Add the following:

Approved on-site training of the labour force by the Contractor will be required for all facets of the construction work involved under this contract.

SCC 6 Clause 16(2) **Contractor's copies**

The Contractor will be issued free of charge two sets of paper prints of all drawings, one copy of the tender document and one copy of the signed contract document. Additional copies will be to the Contractor's account.

SCC7 Clause 38(7) **Workmen's compensation**

Amend Clause 38(7) as follows:

The Contractor shall provide proof, that he has paid all contributions required in terms of the provisions of the Workmen's Compensation Act (Act No 30 of 1941, as amended), within 28 days of the Commencement Date.

SCC 8 Clause 45(2) **Extension of Time for Completion**

Where the Engineer grants the Contractor extension of time for the completion of the Works the Contractor shall not be entitled to any additional payment for items included under Quantities in respect of such extension of time. This provision shall, however, not prejudice any claim under Clause 51 of the Conditions of Contract.

SCC 8(b) Shortage of Materials

The Tenderer shall ascertain that materials on which his tender based will be available on a continuous basis for the execution of the contract. No additional remuneration or extension of time will be granted should it become necessary to obtain material from other sources.

SCC 9 Clause 49(2) **Application of Contract Price Adjustment**

These clauses shall be deleted in total. Allowances for escalation must be made in the rates tendered for the items stated in the Schedule of Quantities, ie rates shall remain fixed for the full contract period.

SCC 10 Clause 52(2) **Valuation of Material Brought onto site**

Add the following:

Payment for materials on site will only be made for those materials which are physically on site, for which proof of ownership by the Contractor is given an for which ownership has been ceded to the Employer.

The Contractor shall remain responsible for the materials and shall insure them against all risks until such time as they are used or built into the works and taken over by the Employer.

ANNEXURE F

5. PROJECT SPECIFICATION

SCOPE:

This project specification is set out two portions. Portion 1 covers a general description of the project, the facilities available, and the requirements to be met. Portion 2 covers variations and additions to standardised/particular specifications that are applicable to the contract.

a) STATUS

Should any requirements of the project specification conflict with any requirements of the standardized or particular specifications listed in Clause 5.1.2 of the Schedule of Documents, the requirements of the project specification shall prevail.

b) Index to project specifications

Portion 1: The Works

Portion 2: Variations From Standardized Specifications

PORTION 2: VARIATIONS FROM STANDARDIZED SPECIFICATIONS

PSA SANS 1200 A: GENERAL

PSA 1 DEFINITIONS (sub-clause 2.3)

Add the following:

Task	a quantified activity or operation
Daily task	the amount of work an average worker can complete in one day of 9 hours
Daily rate	the remuneration of a day's work, regardless of output
Daily wage	see daily rate
Task rate	the remuneration for a completed task
Daily task rate	the remuneration for a completed daily task
Labour intensive construction	the economically efficient employment of as great a portion of labour as is technically feasible to produce as high a standard of construction as demanded by the specifications and allowed by the funding available, thus the effective substitution of labour for equipment.

PSA 2 PLANT (Subclause 4)

Add Subclause 4.3: Restriction on the use of plant.

"Except for the type of plant, and to the extent permitted in terms of the project specification or approved by the Engineer, in writing, the Contractor shall use only hand tools and equipment in the construction of the Works, or portion(s) of the Works, that are required in terms of the project specification to be constructed using labour intensive methods.

Failure by the Contractor to adhere to this clause will put him in breach of contract. The provisions contained in this contract with regard to labour content and labour intensive construction, are binding, and will be enforced accordingly."

PSA 3 CONSTRUCTION

PSA 3.1 Setting out of Works (Subclause 5.1.1)

The contractor together with the beneficiary of the toilet shall arrange the preferable position of the toilet taking in it account the distance from and too the household

PSA 3.2 Watching Barricading, Lighting and Traffic Crossings. (Subclause 5.2)

Sub-clause 5.2 is amended to read as follows:
"The minimum requirements for watching, barricading, lighting and traffic crossing in public roads shall be as set out in the General Conditions of Contract. The Contractor shall work efficiently so as to cause the least disruption to traffic."

PSA 3.3 Method of Construction (Subclause 5.9)

Except where acceptance of the Contractor's proposed method of construction is stated in the letter accepting a tender, acceptance of the tender does not signify acceptance of such methods of construction and it does not in any way relieve the Contractor of any of his responsibilities for the Works, and it shall not be used as basis for claiming compensation where the proposed methods of construction do not comply with the requirements of the specifications and are not approved of subsequent to the award of the contract.

PSA 4 TESTING

PSA 4.1 Testing Facilities (Sub clause 7.1)

The provision of a laboratory on site will not be compulsory. The Contractor shall make the necessary arrangements with an approved laboratory for the undertaking of any tests that may be required in terms of the relevant sections of SABS 1200. The Engineer's written approval for the use of the services of the aforementioned laboratory will be required.

PSA 5 MEASUREMENT AND PAYMENT

PSA 5.1 Methods and Measurement, All sections

Subclause 8.1.1 is amended to read as follows: -
"Except where otherwise specified in Sub clause 8 of a standardized specification or in the project specification or un the preamble to the schedule, all items in the Schedule shall be measured and shall cover the operations as recommended in the Standard Method of Measurement of civil Engineers Quantities as approved by the South African Institution of civil Engineers and the South African Federation of Civil Engineering Contractors, current at the date of tender notwithstanding any general or local custom."

PSA 5.2 Contractor To Price All Items

Sub clause 8.1.2.3 is amended to include the following:

"The Contractor shall price all the items in the Schedule of Quantities.
These items and prices will form the sole basis for cost evaluation in the settlement of variations other than that provided for in the General Conditions of Contract for the applicable section. In the absence of a price against an item or in the event of a price marked **N/A** or **included** against any item, no claim in respect of additional costs or charges for provision of any of the duties, services, facilities or obligations required in respect of that item will be considered."

PSA 5.3 Dealing with Water on Works

No separate or additional payment will be made for keeping the Works dry nor for shoring and/or additional excavations and backfilling required as a result of trench walls and cutting sides collapsing. It will be assumed that the cost of these items are priced and included in the relevant Pay Items.

PSA 5.4 Training of Labour

A separate item is included to cover the Contractor's overhead costs to provide technical officers in order to train the labourers in the necessary skills required to complete this contract. The actual time spent by the labourers in training will be deemed to be included for in the billed rates for the various items.

PSAB SANS 1200 AB: ENGINEER'S OFFICE

PSAB 1 MATERIALS

PSAB 1.1 Name-boards

one name boards shall be supplied. The name boards shall comply with the details given by the Client.

PSAB 2 OFFICE BUILDINGS

PSAB 2.1 The contractor shall provide and furnish an office for the use of the Engineer's representative as per sub-clause 3.2 of SANS 1200 PSAB.

PSC SANS 1200 C: SITE CLEARANCE

PSC 1 MATERIALS

PSC 1.1 Disposal of Material (Sub clause 3.1)

The material resulting from clearing and grubbing shall be transported to an approved dumping area, or as directed by the Engineer.
Subclause 3.1 is amended to include: "A free-haul distance of 2, 0 kilometres from disposal of cleared and grubbed material shall apply."

PSC 2 CONSTRUCTION

PSC 2.1 Clearing

Sub clause 5.3(a) is amended to read:

"The removal of all trees and tree stumps, not exceeding 1 m girth and bushes (complete with roots), other vegetation, refuse, fences and all other material that may interfere with the construction of the works."
Sub clause 5.3 (c) is deleted.
Sub clause 5.3 (e) is deleted.

PSC 2.2 Conservation of Topsoil (Sub clause 5.6)

Topsoil shall be removed and conserved as directed by the Engineer.

PSC 3 MEASUREMENT AND PAYMENT

PSC 3.1 Clear and Grub (Subclause 8.2.2)

N/A

PSC 3.2 Removals and Conservation of Topsoil

The rate for return of topsoil to borrow pit areas shall cover the cost of loading from stockpile, transporting and spreading as specified and shall be extra over the rate for stripping and stockpiling.

Notwithstanding the provisions of Clause PSC 3.1, no payment for clearing and grubbing will be made in areas designated for the removal and conservation of topsoil, except where so specifically designated by the Engineer.

PSD 3 PLANT

All work shall be carried out using labour intensive methods where possible.

PSD 4 FREE-HAUL (SUB CLAUSE 5.2.5.1)

All haul within the site of works outside the of the boundaries of the Contract as indicated on the drawings shall be regarded as free-haul.

PSE1 ELECTRICAL INSTALLATIONS

PSM1 MECHANICAL INSTALLATIONS

SPECIFICATION

FOR THE

REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS PLANT

INDEX **PAGE NO.**

SPECIFICATION FOR ELECTRICAL WORK

PART 1 - GENERAL

CONTENTS

PART 1 - GENERAL

1. INTRODUCTION

(a) These Standard Specifications cover the general technical requirements for the equipment, materials, installation, testing, commissioning, and maintenance of electrical installations. This specification shall be read in conjunction with the Bills of Quantities and General/Standard specification for this installation.

(b) "Document" shall mean the complete set of contract documents, including the Municipalities Tender Conditions, Tender Qualifications, the Standard Specification, and the Detail Technical Specification including all variation orders issued in terms of the contract.

(c) "Contractor" shall mean the person, partnership, company or firm appointed for the supply, installation, testing, commissioning and maintenance of the Electrical Installation. In the case of the Electrical Installation being a sub-contract, nominated in terms of the Main Contract or otherwise, the word "Contractor" shall also mean "Sub-Contractor" in terms of the Sub-Contract Conditions for the specific installation. Where applicable the Builder or Principal Contractor shall be referred to as "Main Contractor".

2. INSTALLATION WORK

(a) The complete installation shall comply with the requirements of this Specification. Should any discrepancies or contradictions exist between this specification and the Detail Technical Specification for the specific installation, then the latter shall take precedence.

In the event of discrepancies between the drawings, specifications and bill of quantities the Municipality shall decide whether the work as executed shall be re-measured on site or whether re-measurement shall be affected from the working drawings only.

The main contractor shall appoint an electrical contractor timeously, no unnecessary chasing will be allowed.

(b) The Municipalities authorised representative will inspect the installation from time to time during the progress of the work. Discrepancies will be pointed out to the Contractor and these shall be remedied at the Contractor's expense. Under no circumstances shall these inspections relieve the Contractor of his obligations in terms of the Documents.

(c) The Contractor shall notify the Municipality timeously when the installation reaches important stages of completion (e.g. before closing cable trenches, before casting concrete, etc.) so that the Municipalities authorised representative may schedule his inspections in the best interest of all parties concerned.

3. SITE CONDITIONS

Tenderers are advised to visit the site and acquaint themselves with all local conditions pertaining to the execution of the installation before tender closing date. No claims from the Contractor which may arise from insufficient knowledge of site access, type of site, labour conditions, establishment space, transport and loading/unloading facilities, power and water supply, etc. will be considered after submission of tenders

4. WORKMANSHIP AND STAFF

The electrical installation shall be carried out by an electrical contractor whom is registered with the Department of Labour and be in possession of a valid wiremen’s licence in order to issue valid electrical certificate of compliance certificates for both single and three phase electrical installations.

The workmanship shall be of the highest grade and to the satisfaction of the Employer.

All inferior work shall, on indication by the Employer's inspecting officers, immediately be removed and rectified by and at the expense of the Contractor.

5. MAINTENANCE OF INSTALLATIONS

With effect from the date of the Practical completion Certificate the Contractor shall at his own expense undertake the regular servicing of the installation during the maintenance period and shall make all adjustments necessary for the correct operation thereof.

If during the said period the installations is not in working order for any reason for which the Contractor is responsible, or if the installations develop defects, he shall immediately upon being notified thereof take steps to remedy the defects and make any necessary adjustments.

Should such stoppages however be so frequent as to become troublesome, or should the installations otherwise prove unsatisfactory during the said period the Contractor shall, if called upon by the Principle Agent/Electrical Engineer or the Employer, at his own expense replace the whole of the installations or such parts thereof as the Principal Agent/Electrical Engineer or the Employer may deem necessary with apparatus specified by the Principal Agent/Electrical Engineer or the Employer.

6. REGULATIONS (TO BE OF THE LATEST REVISION)

The installation shall be erected and tested in accordance with the Acts and Regulations as indicated in the scope of works. The installation shall be erected and tested in accordance with the following (but not limited to) National Standards:

a) SANS 10142 Code of Practice for the Wiring of Premises

b) SANS 10313 Code of Practice for the Protection of Structures against Lightning

c) SANS 156 Moulded Case Circuit Breakers

d) SANS 164-1 Plugs and Socket Outlets for Household and similar purposes

e) SANS 767 Earth Leakage Protection units

f) SANS 1091 National Colour Standards

g) SANS 1065 Metal Conduits and fittings

h) SANS 1213 Mechanical Cable Glands

i) SANS 60439 Low Voltage Switchgear and Control Assemblies

j) SANS 60669 Switches for household and similar fixed electrical appliances

k) SANS 60947 Low Voltage Switchgear and Control gear

l) SANS 61058 Switches for Appliances

m) SANS 61386 Conduit System for Cable Management

n) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,

o) The Local Government Act 1998 (Act 10 of 1998 (Gauteng)) as amended and the municipal by-laws and any special requirements of the local supply authority.

p) The Fire Brigade services Act 1993 Act 2000 (Act 14 of 2000) as amended,

q) The National Building Regulations and Building Standards Act 1996 (Act 29 of 1996) as amended,

r) The Post Office Act 1998 (Act 124 of 1998) as amended,

s) The Electricity Act 1996 (Act 88 of 1996) as amended and

t) The Regulations of the Local Gas Board where applicable.

Where reference is made to any Code of Practice or Standard Specification in this document the latest edition or amendment shall be applicable, except where specified to the contrary.

7. NOTICES AND FEES

The Contractor shall give all notices required by and pay all necessary fees, including any connection fees or inspection fees, which may be due to the local Supply Authority.

On production of the official account, only the net amount of the fee charged by the Supply Authority for connection of the installation to the supply mains, will be refunded to the Contractor by the Employer.

The Contractor shall issue all notices and pay all of the required fees in respect of the installation to the authorities, and shall exempt the Municipality from all losses, claims, costs or expenditures which may arise as a result of the Contractor's negligence in complying with the requirements of the regulations.

8. SCHEDULE OF FITTINGS

In all instances where schedule of light, socket outlet and power points are attached to or included on the drawings, these schedules are to be regarded as forming part of the specification.

9. QUALITY OF MATERIALS

Only materials of first class quality shall be used and all materials shall be subject to the approval of the Employer.All materials shall be suitable for the conditions under which the materials are installed and used.

Materials manufactured in South Africa shall as far as possible be used and where applicable shall bear the SABS mark. Imported materials shall comply with the requirements of the appropriate B.S. or I.E.C. specification.

10. CONDUIT AND ACCESSORIES

The type of conduit and accessories required for the service, i.e. whether the conduit and accessories shall be of the screwed type, plain-end type or of the non-metallic type and whether metallic conduit shall be black enamelled or galvanised, is specified in Part 2 of this specification.

Unless other methods of installation are specified for certain circuits, the installation shall be in conduit throughout. No open wiring in roof spaces or elsewhere will be permitted.

The conduit and conduit accessories shall comply fully with the applicable SANS specifications as set out below and the conduit shall bear the mark of approval of the South African Bureau of Standards.

a) Screwed metallic conduit and accessories: SANS 61386-1 and 21.

b) Plain-end metallic conduit and accessories: SANS 61386-1 and 21.
c) Non-metallic conduit and accessories: SANS 61386-1 and 21.

All conduit fittings except couplings, shall be of the inspection type. Where cast metal conduit accessories are used, these shall be of malleable iron. Zinc base fittings will not be allowed.

Bushes used for metallic conduit shall be brass and shall be provided in addition to locknuts at all points where the conduit terminates at switchboards, switch-boxes, draw-boxes, etc.

Draw-boxes are to be provided in accordance with the “Wiring Code” and wherever necessary to facilitate easy wiring.

For light and socket outlet circuits, the conduit used shall have an external diameter of 20mm. In all other instances the sizes of conduit shall be in accordance with the “Wiring Code” for the specified number and size of conductors, unless otherwise directed in part 2 of this specification or indicated on the drawings.

Only one manufactured type of conduit and conduit accessories will be permitted throughout the installation.

Running joints in screwed conduit are to be avoided as far as possible and all conduit systems shall be set or bent to the required angles. The use of normal bends must be kept to a minimum with exception of larger diameter conduits where the use of such bends is essential.

All metallic conduit shall be manufactured of mild steel with a minimum thickness of 1,2mm for plain-end conduit and 1,6mm in respect of screwed conduit.

Under no circumstances will conduit having a wall thickness of less than 1,6mm be allowed in screed laid on top of concrete slabs.

Bending and setting of conduit must be done with special bending apparatus manufactured for the purpose and which are obtainable from the manufacturers of the conduit systems. Damage to conduit resulting from the use of incorrect bending apparatus or methods applied must on indication by the Municipalities inspectorate staff, be completely removed and rectified and any wiring already drawn into such damaged conduits must be completely renewed at the Contractor's expense.

Conduit and conduit accessories used for flame-proof or explosion proof installations and for the suspension of luminaires as well as all load bearing conduit shall in all instances be of the metallic screwed type.

All conduit and accessories used in areas within 50 km of the coast shall be galvanised to SANS 32 and SANS 121.

Tenderers must ensure that general approval of the proposed conduit system to be used is obtained from the local electricity supply authority prior to the submission of their tender. Under no circumstances will consideration be given by the Municipality to any claim submitted by the Contractor, which may result from a lack of knowledge in regard to the supply authority's requirements.

11. CONDUIT IN ROOF SPACES

Conduit in roof spaces shall be installed parallel or at right angles to the roof members and shall be secured at intervals not exceeding 1,5m by means of saddles screwed to the roof timbers.

Nail or crampets will not be allowed.

Where non-metallic conduit has been specified for a particular service, the conduit shall be supported and fixed with saddles with a maximum spacing of 450 mm. The Contractor shall supply and install all additional supporting timbers in the roof space as required.

Under flat roofs, in false ceilings or where there is less than 0,9m of clearance, or should the ceilings be insulated with glass wool or other insulating material, the conduit shall be installed in such a manner as to allow for all wiring to be executed from below the ceilings.

Conduit runs from distribution boards shall, where possible terminate in fabricated sheet steel draw-boxes installed directly above or in close proximity to the boards.

12. SURFACE MOUNTED CONDUIT

Wherever possible, the conduit installation is to be concealed in the building work; however, where unavoidable or otherwise specified under Part 2 of the specification, conduit installed on the surface must be plumbed or levelled and only straight lengths shall be used.

The use of inspection bends is to be avoided and instead the conduit shall be set uniformly, and inspection coupling used where necessary.

No threads will be permitted to show when the conduit installation is complete, except where running couplings have been employed.

Running couplings are only to be used where unavoidable and shall be fitted with a sliced couplings as a lock nut.

Conduit is to be run on approved spaced saddles rigidly secured to the walls.

Alternatively, fittings, tees, boxes, couplings etc., are to be cut into the surface to allow the conduit to fit flush against the surface. Conduit is to be bedded into any wall irregularities to avoid gaps between the surface and the conduit.

Crossing of conduits is to be avoided, however, should it be necessary purpose-made metal boxes are to be provided at the junction. The finish of the boxes and positioning shall be in keeping with the general layout.

Where several conduits are installed side by side, they shall be evenly spaced and grouped under one purpose-made saddle.

Distribution boards, draw-boxes, industrial switches and socket outlets etc., shall be neatly recessed into the surface to avoid double sets.

In situations where there are no ceilings the conduits are to be run along the wall plates and the beams.

Painting of surface conduit shall match the colour of the adjacent wall finishes.

Only approved plugging materials such as aluminium inserts, fibre plugs, plastic plugs, etc., and round-head screws shall be used for fixing saddles, switches, socket outlets, etc., to walls, wood plugs and the plugging in joints in brick walls are not acceptable.

13. CONDUIT IN CONCRETE SLABS

In order not to delay building operations the Contractor must ensure that all conduits and other electrical equipment which are to be cast in the concrete columns and slabs are installed in good time.

The Contractor shall always have a representative in attendance when the casting of concrete takes place.

Draw-boxes, expansion joint boxes and round conduit boxes are to be provided where necessary. Sharp bends of any nature will not be allowed in concrete slabs.

Draw and/or inspection boxes shall be grouped under one common cover plate and must preferable be installed in passages or male toilets.

All boxes, etc., are to be securely fixed to the shuttering to prevent displacement when concrete is cast. The conduit shall be supported and secured at regular intervals and installed as close as possible to the neutral axis of concrete slabs and/or beams.

Before any concrete slabs are cast, all conduit droppers to switchboards shall be neatly spaced and rigidly fixed.

14. WIRING

Except where otherwise specified in Part 2 of this specification, wiring shall be carried out in conduit throughout. Only one circuit per conduit will be permitted.

No wiring shall be drawn into conduit until the conduit installation has been completed and all conduit ends provided with bushes. All conduits to be clear of moisture and debris before wiring is commenced.

Unless otherwise specified in Part 2 of this specification or indicated on the service drawings, the wiring of the installation shall be carried out in accordance with the “Wiring Code”. Further to the requirements concerning the installation of earth conductors to certain light points as set out in the “Wiring Code”, it is a

specific requirement of this document that where plain-end metallic conduit or non-metallic conduit has been used, earth conductors must be provided and drawn into the conduit with the main conductors to all points, including all luminaires and switches throughout the installation.

Wiring for lighting circuits is to be carried out with 2,5mm² conductors and a 2,5mm²-earth conductor. For socket outlet circuits the wiring shall comprise 2.5mm² conductors and a 2,5mm²-earth conductor. In certain instances, as will be directed in Part 2 of this specification, the sizes of the conductors may be increased for specified circuits. Sizes of conductors to be drawn into conduit in all other instances, such as feeders to distribution boards, power points etc., shall be as specified elsewhere in this specification or indicated on the drawings. Sizes of conductors not specified must be determined in accordance with the "Wiring Code".

The loop-in system shall be followed throughout, and no joints of any description will be permitted.

The wiring shall be done in PVC insulated 600/1000 V grade cable to SANS 1507.

Where cable ends connect onto switches, luminaires etc., the end strands must be neatly and tightly twisted together and firmly secured. Cutting away of wire strands of any cable will not be allowed.

Wiring shall only be carried out after the conduit or trunking installation and plaster work is completed, but before painting has commenced. No conductors shall be installed before the conduits have been cleaned of all debris and moisture.

Conductors that are connected to different switchboards, shall not be installed in the same conduit or trunking.

The wiring of one circuit only will be allowed in 20mm diam. conduit with the exception of the wiring between switchboards and fabricated sheet metal boxes close to switchboards in which case more than one circuit will be allowed.

All wiring shall be carried out according to the loop-in system. If a conductor joint is found necessary in an isolated case, jointing will only be accepted in trunking and not in conduits. Conductor jointing shall be executed by approved ferruling, properly covered with heat shrink sleeving.

The number of conductors that may be drawn through a conduit, shall comply with the requirements of the SANS 10142. The total cross-sectional area of the conductors (including insulation) in trunking or power skirting shall not exceed 40% of the cross-sectional area thereof.

In cases where the conductors of more than one circuit are installed in trunking or power skirting, the conductors of each separate circuit (earth conductor inclusive) shall be taped at intervals of one metre with PVC insulation tape. The conductors of different circuits shall however remain separate in order that any given circuit can be withdrawn. Conductors entering switchboards or control boards shall be grouped and bound by means of plastic binding.

When conductors are drawn through conduit, care shall be taken that they are not kinked or twisted. Care shall also be taken that the conductors do not come into contact with materials or surfaces that may damage or otherwise adversely affect the durability of the conductor.

With the exception of three phase outlets, circuits of different phases shall not be present in lighting, switch or socket outlet boxes.

Conductors installed in vertical conduit or trunking shall be secured at intervals not exceeding 15m to support the mass of the conductors. Clamps shall be provided in suitable draw boxes for this purpose.

The insulation of conductors shall only be removed over the portion of the conductors which enter the terminals of switches, plugs or other equipment. When more than one conductor enters a terminal, the strands shall be securely twisted together.

When earth continuity conductors are looped between terminals or equipment, the looped conductor ends shall be twisted together and then soldered or ferruled to ensure that earth continuity is maintained when the conductors are removed from a terminal.

Cutting away of conductor strands will not be allowed.

The colours of conductor insulation for wiring purposes shall comply with the wiring regulations. The colours of conductors for sub-circuits shall as far as possible correspond with the colour of the supply phase. The colours of conductors for wiring to two-way and intermediate switches shall differ from phase conductors.

Single pole switches shall be connected to the phase conductor and not to the neutral conductor.

The connection to stoves or similar appliance unless specified to the contrary, shall consist of 10mm2 insulated conductors and a 10mm2 bare copper earth wire in a 25mm conduit.

A 60A double pole microgap isolator shall be flush mounted in a wall outlet box behind or adjacent to the stove or appliance in the run of the conduit at least 1350mm but not more than 1700mm above the finished floor level. The cover plate shall either fall entirely within the tiles surface or entirely within the plastered surface.

The conduits shall terminate 450mm above the floor behind the stove or appliance with the end set out of the wall pointing downwards.

The connection from the conduit end shall be by means of flexible conduit of sufficient length to enable the stove or appliance to be moved 600mm from its normal position for cleaning of maintenance purposes.

Crimped lugs shall be provided on all conductors or cable cores for connections to stoves or appliances. Soldered lugs may not be used.

Each stove or similar appliance shall be connected to a separate circuit and each shall have a separate earth conductor.

When earth continuity conductors are looped between terminals of equipment, the looped conductor ends shall be twisted together and then soldered or ferruled to ensure that earth continuity is maintained when the conductors are removed from a terminal. The installation shall be earthed to comply with SANS 10142.

15. SWITCHES AND SOCKET OUTLETS

All switches and switch-socket outlet combination units shall conform to the Municipality Quality Specifications, which form part of this specification.

No other than 16 A 3 pin sockets are to be used, unless other special purpose types are distinctly specified or shown on the drawings.

Switches SABS IEC 60669 as applicable and socket outlets SABS IEC 60884 as applicable shall be of the most modern manufacture and bear the SABS mark.

Switches shall comply with SABS 163. The sockets shall comply with SABS 164.

Flush switch and plug cover plates shall, unless otherwise specified, be of anodized aluminium of thickness not less than 0,9 mm, satin or other approved finish as directed and otherwise to be fully in accordance with SABS IEC 1084 for cover plates and SABS 1085 for wall boxes.

Except where otherwise specified, lighting switches are to be installed 1, 4 m above finished floor level.

Except where otherwise specified, socket outlets are to be installed 0, 450 m above finished floor level.

All mounting heights specified are to be measured from finished floor level to the bottom of the outlet box.

Where the lower portion of the wall consists of face brickwork and the upper portion of plastered finish, switches and socket outlets are to be mounted in the plastered surface, provided that the lower edge of the plasterwork does not exceed a height of 1, 5 m above finished floor level in which case the switches or socket outlets are to be installed in the face brick dado.

Where socket outlet and switch boxes have been installed with fixing lugs below finished wall surface, only approved distance pieces required to compensate for the recess shall be used. The lengths of distance pieces are not to exceed 15 mm.

Unless otherwise approved, light switches adjacent to doors are to be installed at the lock side of the door. Where the lock position is not indicated on the drawings, its position shall be ascertained before the switch box is installed. Switches are to be installed 150 mm from the reveal, or centrally if there is a fitting near the door.

All switch and socket outlet boxes shall be installed plumb, and built into the wall with a 1:1 mixture of cement and sand.

Industrial type switches and socket outlets shall be neatly recessed into the surface of plastered walls to avoid sets or alternatively spacer bar saddles may be used.

Deep type boxes may be used where switches or socket outlets are back to back, but where one side only is to be utilized at the time and the other is for future use, the side for future use shall be suitably covered with a metal cover plate.

All accessible current carrying parts, bus-bars, connecting strips, collector bars, etc., are to be adequately insulated in phase colours and suitably braced to withstand projected fault currents.

Connecting strips and collector bars must be of sufficient cross sectional area to carry full rated current of the switches served, irrespective of the fuse of trip rating.

The complete distribution board including bus-bars must be suitably constructed to withstand fault currents specified.

Connections to bus-bars are to be made by means of lugs suitably bolted and locked with high tensile bolts and connections to lugs must be effected by means of a crimping tools.

Incoming and outgoing bus-bar studs, where required, must be suitably insulated where they pass through panels of the board, and firmly supported within the board.

Where applicable, incoming and outgoing collector bars for cables in parallel must so arrange that the multiple cable ends can be connected to the bars with reasonably short tails which do not have to cross.

Cable supports must be placed at suitable heights having regard to the bending radius of the cables concerned and convenience in making off.

Wall-mounting and floor-standing back to wall type boards must be provided with full easy access to all equipment and wiring without any necessity of disconnecting or removing of any of the equipment mounted in the board.

Clear visible indication of all switch positions must be provided and the switches must be clearly labelled.

16. SWITCHGEAR

Switchgear, which includes circuit breakers, iron-clad switches, interlocked switch-socket outlet units, contactors, time switches, etc., is to be in accordance with the Municipality Quality Specifications which form part of this specification and shall be equal and similar in quality to such brands as may be specified.

For uniform appearance of switchboards, only one approved make of each of the different classes of switchgear mentioned in the Quality Specifications shall be used throughout the installations.

Circuit breakers shall be of the size and type as directed and specified for the service. They shall comply with SABS Specification 156 and SABS IEC 60947-2.

All distribution boards & switchgear shall comply with the quality specification in Part 3 of this specification and be approved by the Employer’s Electrical Engineer.

17. SWITCHBOARDS

All boards shall be in accordance with the types as specified, be constructed according to the detail or type drawings and must be approved by the Employer before installation.

In all instances where provision is to be made on boards for the supply authority's main switch and/or metering equipment the contractor must ensure that all requirements of the authorities concerned in this respect are met.

Any construction or standard type aboard proposed, as an alternative to that specified must have the prior approval of the Employer.

All busbars, wiring, terminals, etc., are to be adequately insulated and all wiring is to enter the switchgear from the back of the board. The switchgear shall be mounted within the boards to give a flush front panel. Cable and boxes and other ancillary equipment must be provided where required.

Clearly engraved labels are to be mounted on or below every switch. The working of the labels in English, is to be according to the lay-out drawings or as directed by the Electrical Engineer and must be confirmed on site. Flush mounted boards to be installed with the top of the board 2,0m above the finished floor level.

All distribution boards & switchgear shall comply with the quality specification in Part 3 of this specification, and be approved by the Employer's Electrical Engineer.

18. TESTS

After completion of the works and before practical completion is achieved, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this

period the installations will be inspected and the Contractor shall make good, to the satisfaction of the Principle Agent/Electrical Engineer or the employer, any defects which may arise.

The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installations at completion.

19. VERIFICATION AND CERTIFICATION OF ELECTRICAL INSTALLATION (CERTIFICATE OF COMPLIANCE AND TEST REPORT

On completion of the service, a certificate of compliance must be issued to the Principal Agent/Electrical Engineer or Employer in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) in the format as set out in SANS 10142-1 & 2.

20. EARTHING OF INSTALLATION

This section covers the earthing of electrical installations in buildings or other structures. The total earthing system of any electrical installation shall be in complete accordance with SANS 10142.

1. GENERAL RECOMMENDATIONS ON THE PRACTICAL INSTALLATION OF EARTH ELECTRODES

1.1 REQUIREMENTS OF AN EFFECTIVE EARTH

1.1.1 An effective earth must prevent dangerous over voltages arising between metallic structures, frames, supports or enclosures of electrical equipment and the ground during fault conditions.

1.1.2 An effective earth must be able to permit fault currents of sufficient magnitude to flow so as to operate protective devices to isolate the fault before damage can occur.

1.1.3 The ohmic resistance of an effective earth must be low enough to ensure that the step potential on the ground in the vicinity of the earthing point is within safe limits under fault conditions i.e. a voltage gradient not exceeding 40 V/m for fault durations exceeding 1s.

1.2 TYPES OF EARTH ELECTRODES

Three types of earth electrodes are suitable:

1.2.1 <u>Trench Earths</u>

Trench earths comprise a bare copper or galvanised iron conductor laid at a minimum of 800mm below ground level, usually when underground cables are installed. This type of earth electrode provides a relatively large contact area between electrode and surrounding ground, makes contact with a variety of types of soil and soils of varying moisture content en route and is economical to install.

1.2.2 Spike Earths

Spike earths comprise rods of bare copper, copper-coated steel, stainless steel or galvanised steel designed for the purpose of penetrating ground to depths of up to several metres. A low resistance earth may sometimes be obtained by driving multiple spikes at some distance from each other in order to provide parallel paths.

In hard or rocky ground, it is usually necessary to drill holes into which earth spikes are inserted and then packed with soft soil.

1.2.3 Foundation Earths

Foundation earths comprise bare copper or galvanised iron conductors laid under the foundations of buildings, miniature substations, distribution pillars, bases of wooden, concrete or steel poles and structures. Because soil under foundations usually retains moisture, foundation earths are located to take advantage of this favourable condition. Furthermore, they are economical to install.

1.3 MATERIALS FOR EARTH ELECTRODES

1.3.1 Bare copper, either in stranded, strip or rod form, is considered the most suitable general purpose material for earth electrodes. Its main disadvantage is its cost and susceptibility to theft.

1.3.2 Bare galvanised iron and steel, either in stranded, strip or rod form, has a satisfactory record of survival in non-aggressive soils and is more economical than copper.

1.3.3 Bare aluminium is unsuitable as electrode material.

1.4 CORROSION

Because galvanised ferrous metals corrode sacrificially to copper, galvanised iron and steel electrodes should not be buried in close proximity to bare copper.

2. TECHNICAL REQUIREMENTS OF NEUTRAL EARTHING

The following relevant aspects have been extracted from the "AMEU CODE OF PRACTICE FOR THE APPLICATION OF NEUTRAL EARTHING ON LOW VOLTAGE DISTRIBUTION SYSTEMS."

2.1 DISTRIBUTION SYSTEMS

Multiple Earthed Neutral (MEN) and Protective Multiple Earthing (PME) systems.

Distribution equipment associated with transformer substations that are either ground mounted or pole mounted and fed by underground cable or overhead line, with or without an earth continuity conductor, (ECC), should be installed, connected and earthed in accordance with the following requirements:

(a) Where the resistance to earth of the HV equipment earth is 1 ohm or less, it is permissible to earth the LV neutral to the HV earth electrode.

(b) Where the HV equipment earth exceeds 1 ohm the LV neutral shall be earthed at a minimum distance of 6m from the HV equipment earth (i.e. 6m from the HV electrode/s and also from any earthed metalwork connected thereto).

(c) Notwithstanding the requirements of (a) above, where transformers are associated with HV overhead lines, it is considered good practice to separate the HV and LV earth electrodes. The minimum earth separation should be 6m or one LV span.

(d) The overall resistance to earth of the neutral of an LV distributor or distribution system must not exceed 1 ohm.

(e) The LV neutral may be connected to other supply neutrals, earth electrodes, cable sheaths and armouring and these connections used to obtain the required earthing value of 1 ohm or less specified in par. (d). above.

(f) The neutral of underground and overhead LV distributors must be earthed at the remote ends of each distributor.

(g) Where the overall resistance to earth of the neutral of the distribution system exceeds 1 OHM, the neutral shall be earthed at intermediate positions on the distributor/s to reduce its resistance to earth to below this limit.

(h) The cross-sectional area of the neutral of all LV distributors must not be less than that of a phase conductor.

(i) No circuit-breakers, isolators, fuses, switches or removable links shall be installed in the neutral between the transformer star point and the remote end of any LV distributor or service connection.

(j) All metallic sheathing and armouring of cables and all metalwork associated with meter cabinets, fuse pillars, etc., supporting or enclosing LV cables shall be bonded to the distributor neutral conductor.

(k) Where a Separate Neutral Earth (SNE) cable is part of an MEN or PME system, the armouring and/or metallic sheath and any ECC shall be bonded to the neutral at the supply end of the cable.

(l) To ensure the integrity of the neutral, it is recommended that all connections and joints on or to overhead line conductors be made by compression fittings or, alternatively double bolted connectors.

(m) MEN or PME may be applied to any single LV distributor without alterations to other LV distributors supplied from the same transformer.

2.2 PROTECTIVE NEUTRAL BONDING (PNB) SYSTEM

Since the neutral is earthed at one point only, the question of multiple earthing does not arise and there is therefore no necessity to meet the MEN/PME technical requirements.

2.3 SERVICE CONNECTIONS

2.3.1 MEN System

The following conditions apply to consumers' service connections as well as service connections to traffic signals, road signs, street lighting and other power-consuming equipment installed in public places:

(a) All service connections must be by means of cable with an insulated phase, an insulated neutral conductor and an ECC.

(b) A single phase service connection comprises a live, a neutral and an ECC.

(c) A polyphase service connection comprises two or three phase conductors, a neutral and an ECC.

(d) The service neutral and ECC must be solidly and separately connected to the distributor neutral at the tee-off point.

(e) The consumer's earthing lead is connected to the Supply Authority's earth terminal which is in turn connected to the ECC in the service cable at the consumer's supply point.

(f) The neutral must not be connected to earth at the consumer's supply point.

(g) If required by the Supply Authority, and earth electrode must be installed at the consumer's supply point.

2.3.2 PME System

(a) All service connections must be by means of a cable with an insulated phase and an insulated neutral conductor.

(b) A single phase service comprises a live conductor and a neutral.

(c) A polyphase service connection comprises two or three phase conductors and a neutral.

(d) The consumer's earthing lead is connected to the supplier's neutral and to a mandatory earth electrode at the consumer's supply point.

(e) A label must be attached at the consumers supply point on his premises indicating that the installation is part of a PME system.

Note: It is not recommended that the PME system be applied to supply traffic signals, street signs or other power-consuming equipment installed in public places, because the PME system is inherently unsafe under "broken-neutral" conditions.

3. SUBSTATION EARTHING

In order to comply with the requirements of par. 1 and 2 above, an earth resistivity measurement shall be undertaken at the site of a new substation or miniature substation, preferably be a specialist firm. The contractor shall then submit to the Municipality details of a proposed substation earth indicating whether a trench earth, spike earth or foundation earth is intended and the proposed interconnections with the installation.

4. FENCES OF OUTDOOR SUBSTATIONS

In cases where substations contain transformers or switchgear installed outdoors, the compulsory fence shall be earthed as follows, if no other method is specified:

(a) A 70mm² earth wire shall be installed 400mm below ground level and 500mm from the fence on the outside of the sub-station along the entire length of the fence. This earth wire shall be earthed at each corner by means of a 1,8m earth rod and the rod and earth wire bonded to the fence. The earth wire shall also be bonded, at least at two points, to the main earthing system.

(b) A 70mm² earth wire shall also be buried at a depth of 400mm around each transformer and switch and bonded to the main earthing system.

5. EARTHING OF A GENERAL ELECTRICAL INSTALLATION

The installation shall be effectively earthed in accordance with the relevant sections of the SANS Code of Practice 10142 and the requirements of the Supply Authority.

The type of main earthing must be as required by the supply authority if other than the Employer, and in any event as directed by the Principal Agent/Electrical Engineer, who may require additional earthing to meet test standards.

Where required an earth mat shall be provided, the minimum size, unless otherwise specified, being 1,0m x 1,0m and consisting of 4mm diameter hard-drawn bare copper wires at 250mm centres, brazed at all intersections.

Alternatively or additionally earth rods or trench earths may be required as specified or directed by the Electrical Engineer.

Installations shall be effectively earthed in accordance with the “Wiring Code” and to the requirements of the supply authority. All earth conductors shall be stranded copper with or without green PVC installation.

Connection from the main earth bar on the main board must be made to the cold water main, the incoming service earth conductor, if any and the earth mat or other local electrode by means of 12mm x 1, 60 mm solid copper strapping or 25 mm² stranded (not solid) bare copper wire or such conductor as the Municipalities representative may direct. Main earth copper strapping where installed below 3m from ground level, must be run in 20 mm diameter conduit securely fixed to the walls.

All other hot and cold water pipes shall be connected with 12mm x 1.5mm solid copper strapping (not conductors) to the nearest switchboard. The strapping shall be fixed to the pipework with brass nuts and bolts and against walls with brass screws at 150-mm centres. In all cases where metal water pipes, down pipes, flues, etc., are positioned within 1,6m of switchboards an earth connection consisting of copper strapping shall be installed between the pipework and the board. In vertical building ducts accommodating both metal water pipes and electrical cables, all the pipes shall be earthed at each distribution board.

Roofs, gutters and down pipes

Where service connections consist of overhead conductors, all metal parts of roofs, gutters and down pipes shall be earthed. One bare 10mm² copper conductor shall be installed over the full length of the

ceiling void, fixed to the top purlin and connected to the main earth conductor and each switchboard. The roof and gutters shall be connected at 15m intervals to this conductor by means of 12mm X 1.5 mm copper strapping (not conductors) and galvanised bolts and nuts. Self-tapping screws are not acceptable. Where service connections consist of underground supplies, the above requirements are not applicable.

Sub-distribution boards

A separate earth connection shall be supplied between the earth busbar in each sub-distribution board and the earth busbar in the Main Switchboard. These connections shall consist of a bare or insulated stranded copper conductors installed along the same routes as the supply cables or in the same conduit as the supply conductors. Alternatively armoured cables with earth continuity conductors included in the armouring may be utilised where specified or approved.

Sub-circuits

The earth conductors of fall sub-circuits shall be connected to the earth busbar in the supply board in accordance with SANS 10142.

Ring Mains

Common earth conductors may be used where various circuits are installed in the same wire way in accordance with SANS 10142. In such instances the sizes of earth conductors shall be equivalent to that of the largest current carrying conductor installed in the wire way, alternatively the size of the conductor shall be as directed by the Engineer. Earth conductors for individual circuits branching from the ring main shall by connected to the common earth conductor with T-ferrules or soldered. The common earth shall not be broken.

Non-metallic Conduit

Where non-metallic conduit is specified or allowed, the installation shall comply with the Municipalities standard quality specification for “conduit and conduit accessories”.

Standard copper earth conductors shall be installed in the conduits and fixed securely to all metal appliances and equipment, including metal switch boxes, socket-outlet boxes, draw-boxes, switchboards, luminaires, etc. The securing of earth conductors by means of self-threading screws will not be permitted.

Flexible Conduit

An earth conductor shall be installed in all non-metal flexible conduit. This earth conductor shall not be installed externally to the flexible conduit but within the conduit with the other conductors. The earth conductor shall be connected to the earth terminals at both ends of the circuit.

Connection

Under no circumstances shall any connection points, bolts, screws, etc., used for earthing be utilised for any other purpose. It will be the responsibility of the Contractor to supply and fit earth terminals or clamps on equipment and materials that must be earthed where these are not provided.

Unless earth conductors are connected to proper terminals, the end shall be tinned and lugged.

21. MOUNTING AND POSITIONING OF LUMINAIRES

The Contractor is to note that in the case of board and acoustic tile ceilings, i.e. as opposed to concrete slabs, close co-operation with the building contractor is necessary to ensure that as far as possible the luminaires are symmetrically positioned with regard to the ceiling pattern.

The layout of the luminaires as indicated on the drawings must be adhered to as far as possible and must be confirmed with the Municipalities representative.

Luminaires installed against concrete ceilings shall be screwed to the outlet boxes and in addition 2 x 6mm expansion or other approved type fixing bolts are to be provided. The bolts are to be ¾ of the length of the luminaires apart.

Luminaires to be mounted on board ceilings shall be secured by means of two 40mm x No. 10 round head screws and washers. The luminaires shall also be bonded to the circuit conduit by means of locknuts and brass bushes. The fixing screws are to be placed ¾ of the length of the fitting apart.

Earth conductors must be drawn in with the circuit wiring and connected to the earthing terminal of all fluorescent luminaires as well as other luminaires exposed to the weather in accordance with the “Wiring Code”.

Incandescent luminaires are to be screwed directly to outlet boxes in concrete slabs. Against board ceilings the luminaires shall be secured to the brandering or joists by means of two 40mm x No. 8 round head screws.

PART 2: DETAILSPECIFICATION & INSTALLATION DETAILS

CONTENTS

PART 2: DETAIL SPECIFICATION & INSTALLATION DETAILS

1. CABLE SLEEVE PIPES

Where cables cross under roadways, other services and where cables enter buildings, the cables shall be installed in earthenware or high-density polyethylene pipes.

The ends of all sleeves shall be sealed with a non-hardening watertight compound after the installation of cables. All sleeves intended for future use shall likewise be sealed.

2. NOTICES

The Contractor shall issue all notices and make the necessary arrangements with Supply Authorities, the Postmaster-General, and S.A. Transport Services, Provincial or National Road Authorities and other authorities as may be required with respect to the installation.

3. ELECTRICAL EQUIPMENT

All equipment and fittings supplied must be in accordance with the attached quality specification (Part 3 of this document), suitable for the relevant supply voltage, and frequency and must be approved by the Employers Electrical Engineer. The electrical contractor is to provide samples of all electrical equipment for approval by the consulting engineer and the Municipalities engineer. All samples are to be approved prior to any bulk purchase.

4. DRAWINGS

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

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

5. BALANCING OF LOAD

The Contractor is required to balance the load as equally as possible over the multiphase supply.

6. SERVICE CONDITIONS

All plant shall be designed for the climatic conditions appertaining to the service.

7. SWITCHES AND SOCKET OUTLETS

The installation of switches and socket outlets must conform to clause 15 of Part 1 of this specification.

The Contractor shall supply and install all the light switches and power outlets as indicated on the drawings. The locations of the light switches and power outlets shown on the drawings are only indicative and the Contractor shall confirm the actual positions of all points on site to suit the final position of the respective equipment to be connected.

Isolators shall be 2-pole or 3-pole of the no-load type as required, and be suitably rated for the load to be connected. Externally mounted isolators shall be enclosed in suitable weatherproof glass-reinforced polyester (GRP) enclosures with sliding lids. All connections from isolators have been measured in the Bills of Quantities.

Indoor light switches and socket outlets shall be installed in flush wall mounted boxes. The switch cover plates shall be white PVC that clip-in to the switch cradle or are fixed with chrome-plated fixing screws as applicable.

Outdoor socket outlets shall be installed in suitable GRP boxes with sliding lid, which are either flush or surface mounted as indicated on the drawings.

Outdoor light switches shall be of the water tight surface mounted type with metal body and rotary switch rated at 16 A, as per 'WACO' type NS3500 or similar and approved.

Labels shall be provided on the inside of all switches and power outlet cover plates.

Light sensitive (daylight) switches shall be equal and approved to "NATIONAL" or "ROYCE Thompson" and shall be installed in an approved bulkhead fitting for the control of outside lights. The daylight switch shall be of the fail-safe type and shall comprise a photo-electric cell, thermal actuator and a change-over switch rated at 15A, 230v. The Contractor shall ensure that the operation of the daylight switch is not affected by nearby light fittings.

8. LIGHT FITTINGS AND LAMPS

The installation and mounting of luminaires must conform to clause 21 of Part 1 of this specification.

All fittings to be supplied by the Contractor shall have the approval of the Employer.

The light fittings must be of the type specified in the Schedule of Light Fittings.

All equipment and fittings supplied must be in accordance with the attached quality specification (Part 3 of this document), suitable for the relevant supply voltage, and frequency and must be approved by the Employers Electrical Engineer.

Lamps and electrical components used in fittings shall comply with the relevant SANS standard and wherever possible shall bear the SABS mark or alternatively shall indicate compliance with the equivalent IEC standard. No-name brands are <u>not</u> acceptable.

All emergency lighting luminaries shall comply with SANS 10114-2. Unless otherwise specified, emergency lighting battery units installed within or adjacent to the luminaries shall be of the maintained mode type and are capable of operating one lamp at 20% light output for 60 minutes. The unit shall have a self-testing facility that constantly monitors the status of the unit and discharges the nickel-cadmium batteries on a regular basis. An LED status indication lamp shall be provided in a clearly visible position in/on the fitting.

Low voltage (12V) halogen "Dichroic" lamps shall be of the type rated at 4000 hrs and shall be as per "OSRAM TITAN" or other approved.

All lamps supplied with the light fittings shall be from a reputable manufacturer, such as the following:

'GE', 'OSRAM', 'PHILIPS' or 'SYLVANIA'.

The Contractor shall where necessary make allowance for additional fixing members, such as timber battens in suspended ceilings, in order to provide for the number of light points called for in this specification or indicated on the drawings.

As a minimum, all light fittings surface mounted against standard round conduit boxes shall be fixed with at least two (2) non-rust screws such as brass or stainless steel.

All light fittings recessed in suspended ceilings with removable tiles shall be connected by means of flexible cable, plug and socket arrangement. The flexible cable shall be a minimum of 1.5mm² PVC insulated and shall not exceed 3m in length.

Sockets installed within ceilings voids beneath reinforced concrete slabs shall be securely fixed against ceiling slab or suspended trunking and shall accessible from below the ceiling. In situations like in roof structures or in ceilings where the voids are excessive, the socket outlets shall be fixed to rigid roof structure members or to a rigid wireway system to the approval of the Engineer.

The Contractor shall maintain close liaison with the ceiling specialist when installing recessed fittings.

Fittings mounted against suspended board ceilings shall, in addition to being fixed to the conduit outlet box, be fixed at two points using 50mm No.10 round head brass screws and oversize washers. Fittings mounted against concrete or brick surfaces shall be fixed with at least two No 8 plastic anchors and 50mm No10 round head screws and oversize washers. Fender washers shall be used when fixing fluorescent fittings. Fittings may only be fixed direct onto conduit boxes if additional fixings are provided.

Fittings mounted against steel trunking shall be fixed with "P2540" hollow brass adapters. Fittings mounted against steelworks shall be fixed with approved galvanised steel brackets. Drilling of steelworks for fixing purposes may only be done with the approval of the Structural Engineer.

High-bay fittings suspended from roof trusses shall be fixed by means of galvanised steel chain having links of not less than 5mm diameter. Each fitting shall be suspended with two (2) separate steel chains utilising "CADDY" clips or other approved fixing devices.

Outdoor mounted fittings exposed to the weather shall suitably sealed to prevent ingress of moisture into the fittings or conduit boxes.

The connection to outdoor floodlights or equipment using a similar flexible connection shall be carried out with uv-resistant neoprene cable of suitable cross-section.

Supply of light fittings

The contractor shall allow in the tender for the cost of administration, offloading on site, storage, handling, installation, cleaning and commissioning of all indoor and outdoor light fittings, as indicated on the drawings. The Sub-contractor shall be held liable for any damage to luminaires from the date of receipt until the date of handover to the Employer.

Installation of light fittings

In all cases where luminaires are fixed to ceilings, the Contractor shall ensure that the ceiling is capable of carrying the weight of the luminaires before commencing installation. Should any doubt exist in this regard, the matter shall be referred to the Municipality. All additional required supports to be included within the installation rate of the specific light fitting.

The various types of light fittings required in the execution of the sub-contract are shown on the drawings.

(a) Positions

The mounting positions of light fittings shall be verified on site. All fittings shall be placed symmetrically with respect to ceiling panels, batons, beams, columns or other architectural features of the space. The layout as shown in the Drawings shall generally be adhered to but any discrepancies or clashes with structural or other features must be referred to the Engineer before commencing erection of the installation. Should the Contractor neglect to refer such discrepancies to the Engineer, cost incurred as a result of subsequent alterations to suit the architectural features will be to the Contractor's account.

(b) Hangers and supports

Where provision has not been made for the support of fittings, the Domestic Sub-Contractor shall supply the necessary supports, hangers, conduit extensions, angle brackets or any fixing method approved by the Engineer.

(c) Ceilings

In all cases where light fittings are installed in ceilings, the ceiling shall be capable of carrying the weight of the fittings. Ceilings shall either be of the concealed 'T' acoustic tile or plaster board type. When installing fluorescent fittings in ceilings, a gap shall not be visible between the fitting and the ceiling. Fittings shall be constructed for installation from below.

(d) Continuous rows of light fittings

In cases where fluorescent fittings are installed in tandem, only one connection point need to be supplied per circuit. All fittings shall be coupled to one another by means of nipples or bushes and lock nuts to ensure that the wiring is not exposed and that earth continuity is maintained. Fittings on the same circuit may be wired through the channel formed by the fitting canopies. In this case silicon-rubber insulated conductors shall be used and internal connections shall be made at terminal blocks, Screw connectors are not acceptable. The wiring for any other circuits or outlets, even though these may be in the same row may not be installed through the fitting canopies. The Domestic Sub-Contractor shall ensure that continuous rows are straight and parallel to the relevant building lines.

(e) Recessed light fittings

Where recessed light fittings are indicated the Domestic Sub-Contractor shall maintain close liaison with the Ceiling Contractor. In the case of tiled ceilings, the fittings shall be installed while the metal supports are being installed and before the tiles are place in position. The Contractor shall ensure that the ceiling is capable of carrying the weight of the luminaires before commencing installation.

The Domestic Sub-Contractor shall be responsible for the co-ordination of the cutting of ceiling tiles or plasterboard with the Ceiling Contractor. All mounting rings and other accessories shall fit closely into cut-outs to ensure a proper finish.

(f) Waterproof light fittings

Waterproof and flameproof fittings shall be screwed directly to the conduit end. Draw boxes that may be required must be approved by the Engineer beforehand.

(g) Bulkhead fittings

Surface mounted bulkhead fittings shall not be screwed directly to conduit ends. The conduit shall terminate in a round draw box at the back of the fitting. The PVC insulated conductors shall terminate in a porcelain terminal block in the draw box. Asbestos or silicon-rubber insulated conductors shall be used from the terminal block to the fitting lamp holder. Screw connectors will not be allowed.

(h) Luminaires fixed to Ceilings

In all cases where luminaires are fixed to false ceilings, the Contractor shall ensure that the ceiling is capable of carrying the weight of the luminaires before commencing installation. Should any doubt exist in this regard, the matter shall be referred to the Municipality.

In cases where the weight of the luminaire is not carried by the ceiling but by a support or other suspension method, provision shall be made to prevent relative movement between the ceiling and luminaire, ceiling rose or connection point.

Surface mounted fluorescent luminaires shall fit firmly against the ceiling brandering without leaving gaps between luminaire and ceiling. The luminaire shall be fixed directly to the ceiling by means of brass plated round-head wood screws and washers or butterfly screws.

In case of tiled ceilings with exposed or concealed T-section supports, surface mounted luminaires shall be fixed only to the tiles by means of butterfly screws. The tiles shall be suitably reinforced. Luminaires may alternatively be fixed to metal cross-pieces resting in the ceiling tees.

Drilling of holes in ceiling tees to support luminaires will not be allowed. Luminaires shall be fixed in neat relation to the ceiling lay-out.

(i) Type of Conductor

PVC insulated conductors, unless protected by an approved heat-resistant sheathing, shall not be used where the temperature of the insulation is likely to exceed 700C. In unventilated luminaires or luminaires capable of housing incandescent laps over 60W, the interconnecting wiring from the lamp holder to the circuit wiring shall consist of silicon-rubber insulated conductors. Silicon-rubber insulated conductors shall be used exclusively in the case of high bay fittings.

9. EARTHING AND BONDING

The Contractor will be responsible for all earthing and bonding of the building and installation. The earthing and bonding is to be carried out strictly as described in clause 20 of Part 1 of this specification and to the satisfaction of the Employer/s Electrical Engineer.

The resistance of the main electrical earth shall be not less than 1 ohm.

10. MAINTENANCE OF ELECTRICAL SUPPLY

All interruptions of the electrical supply that may be necessary for the execution of the work, will be subject to prior arrangement between the Contractor and the Client and the Employer's Electrical Engineer.

11. EXTENT OF WORK

The work covered by this contract comprises the complete electrical installation, in working order, as shown on the drawings and as per this specification, including the supply and installation of all fittings and also the installation of such equipment supplied by the Employer.

Site Location

The site of the proposed refurbishment of the Water treatment works plant is located within the Amersfoort Municipality, Gert Sibande District ,at site co-ordinates: Latitude - 28°55'41" S Longitude - 29°52'44"E.

Key Plan

A	Intake
B	Pump Stations
C	Coagulation/Flocculation Basin
D	Sedimentation Basin
E	Rapid Gravity Sand Filter
F	Drying Beds

Figure 1: AMERSFOORT WATER TREATMENT PLANT

Main Low Voltage Panel

- Refurbishment of existing Main Low Voltage Electrical Panel
- Removal of existing circuit breakers
- Install new circuit breakers
- Issue Certificate of compliance

Abstraction works Main Electrical panel and motor control panel

- Refurbish existing panel

- Test existing main low voltage panel
- Test existing motor control circuits and equipment
- Provide conditional assessment report
- Remove and replace existing circuit breakers with new circuit breakers
- Remove and replace motor control equipment with new equipment
- Issue Certificate of compliance

Amersfoort Main Electrical panel and motor control panel

- Refurbish existing panel
- Test existing main low voltage panel
- Test existing motor control circuits and equipment
- Provide conditional assessment report
- Remove and replace existing circuit breakers with new circuit breakers
- Remove and replace motor control equipment with new equipment
- Issue Certificate of compliance
-

Perderkop Main Electrical panel and motor control panel

- Refurbish existing panel
- Test existing main low voltage panel
- Test existing motor control circuits and equipment
- Provide conditional assessment report
- Remove and replace existing circuit breakers with new circuit breakers
- Remove and replace motor control equipment with new equipment
- Issue Certificate of compliance

Daggakraal Main Electrical panel and motor control panel

- Refurbish existing panel
- Test existing main low voltage panel
- Test existing motor control circuits and equipment
- Provide conditional assessment report
- Remove and replace existing circuit breakers with new circuit breakers
- Remove and replace motor control equipment with new equipment
- Issue Certificate of compliance

Sand filter backwash and Sump Pump Main Electrical panel and motor control panel

- Refurbish existing panel
- Test existing main low voltage panel
- Test existing motor control circuits and equipment
- Provide conditional assessment report
- Remove and replace existing circuit breakers with new circuit breakers
- Remove and replace motor control equipment with new equipment
- Issue Certificate of compliance

Low Voltage Reticulation

The scope of work consists, but may not be limited to the following:

- Installation of the electrical reticulation from the point of supply to the DB's.
- Installation of new LV DB's and issuing electrical CoC's.
- Installation of new LV reticulation cables in sleeves,

Lighting & Power Installation

The scope of work consists, but may not be limited to the following:

- Installation of new containment or wire ways for new lighting & power installation
- Installation of conductors/ lighting circuits as indicated on the drawings.
- Installation of new light fittings and power points.

13. WIREWAYS

All conduits, regardless of the system employed, shall be installed strictly as described in the applicable paragraphs of Part 1 of the specification. Wiring of the installation shall be carried out as directed in part 1 of this specification.

Where plain end conduit is offered all switches and light fittings must be supplied with a permanent earth terminal for the connection of the earth wire.

Lugs held by switch fixing screws or self-tapping screws will not be acceptable.

PVC conduit is to be utilized in when recessed in brick work or cast in concrete. Hot Dip Galvanized metal conduit to be utilized where conduit is to be installed outdoors & within all roof spaces. All conduits to be SABS approved.

The Contractor shall ensure that all wireways are completed timeously, so as not to delay building operations, and shall advise the Municipalities Representative, in good time, of such intended completion, so that it may be inspected prior to being covered up. The Contractor shall be in attendance when the Municipalities Representative carries out all such inspections.

The cut ends of all galvanised steel wireways shall be painted with zinc-rich cold galvanizing paint.

The various wireways used shall be as follows:

a) CONDUIT

Unless otherwise specified, all conduit concealed in floor slabs, walls & building structure shall be PVC. No surface mounted PVC conduit shall be permitted.

The tubing shall enable the loop-in wiring system to be followed throughout the installation. The Contractor shall allow 25% spare conduit between all flush mounted distribution boards and ceiling spaces.

Where conduit outlet boxes or draw boxes are mounted on finished surfaces, the Contractor shall ensure that such outlets are mounted symmetrically. It will not be sufficient to scale the positions of any outlet off drawings.

Drawboxes with blank covers shall be allowed for, in the conduit runs as necessary. Drawboxes with sliding conduit shall be installed where conduit crosses expansion joints. Galvanised draw-wire of 1,6mm diameter shall be drawn in all conduit provided for other services.

Conduit in roof spaces must be installed neatly and must wherever possible run along and/or at right angles to roof trusses and must not cross-over.

At building expansion joints, all the conduits must be provided with conduit expansion joints with a positive earth wire connection.

'Kopex' or other approved flexible conduit shall be used to connect movable appliances using approved connectors, etc. Earth conductors shall be installed together with PVC conductors in flexible conduit to ensure earth continuity.

Where plain-end hot dipped galvanized conduit is specified all switches and light fittings must be supplied with a permanent earth terminal for the connections of the earth wire.

b) CONDUIT OUTLET BOXES

Round conduit boxes shall be not less than 50mm deep PVC with brass screw inserts. Outlet boxes for switches and power points shall be 100 x 50 mm and 100 x 100mm galvanised steel. PVC outlet boxes will be permitted in open semi-exposed areas as directed by the Municipalities Representative.

c) TRUNKING

The Contractor shall be responsible for the supply and installation of all power trunking complete with corner pieces, end pieces, junction pieces, supply conduits, cover plates and power outlets as specified and indicated on the drawings.

The power trunking must comply with SANS 61084. The Contractor must ensure that the power trunking is installed to satisfaction of the Employer's Electrical Engineer before commencing with the wiring of the power trunking.

Trunking shall be installed as indicated on the drawings. All trunking and trunking accessories shall be similar or equal to O-Line Support Systems and both shall be hot dip galvanized to SANS 32. Trunking shall be installed complete with clip-on galvanized metal covers. Adjoining lengths shall be correctly aligned and securely joined by means of connection pieces that are pop-rivetted to both abutting sections. All adjoining sections shall be of identical rectangular section and shall butt tightly. Covers shall fit tightly across the joint.

Trunking shall be installed open end up wherever possible, but where it is installed on its side or in vertical runs all conductors shall be retained by means of metal clips or metal spacer bars at not less than 1m centres. All trunking shall be vermin proof after installation. All holes shall be covered by metal plugs or by means of metal strips that are pop-riveted to the channel.

Electrical and mechanical continuity shall be maintained throughout the trunking installation. A tinned copper bonding strip shall be installed across each joint and secured to both adjoining lengths by means of brass bolts, nuts and washers. The trunking shall be bonded to the earth bar of the associated switchboard.

All bends shall be of easy sweep design with 45° cornices. Burrs and sharp edges shall be removed and the inside edges of all joints shall be lined with silicon or other suitable rubberised compound to prevent conductor insulation laceration.

Trunking shall be large enough to ensure that the combined total cross-sectional area (including insulation) of all conductors does not exceed 40% of the cross-sectional area of the trunking.

The Contractor shall supply and install all hangers, supports or fixings required for the trunking. Trunking up to 127mm x 75mm shall be supported at maximum intervals of 1500mm and where trunking is suspended from roof structures this shall be done using CS3300 and threaded galvanized rods. Trunking runs shall be carefully planned to avoid clashes with other services and to ensure that all covers can be removed after completion of the entire installation.

All conduit connections shall be terminated by means of a female bush. All holes which conductors pass through shall be equipped with grommets.

14. WIRING

Wiring of the installation shall comply with General Specification Part 1 for Electrical Installations.

Wiring details for power and lighting circuits shall be as indicated on the dB schematics.

No open wiring nor the drawing of mixed circuits nor the drawing of more than two circuits of the same type of load per conduit will be permitted

All wiring of individual circuits installed in trunking or power skirting shall be harnessed together to facilitate the ease of identification of such circuits.

The wiring in roof spaces above ceilings with removable suspended tiles shall be wired via a wireway system of galvanised steel trunking and PVC conduit that provides maximum flexibility. The wireway system shall be to the approval of the Municipalities Representative. The final connection to recessed light fittings shall be via 6 A socket outlets which are within arm's reach of the fitting.

All wiring installed in conduit concealed within hard board ceilings shall be accessible from below the ceiling for re-wiring purposes. The final connection to recessed light fittings in hard board ceilings shall be via 6 A socket outlets in round conduit boxes that are connected to flexible PVC conduit. The flexible conduit shall be of sufficient length to enable the light fitting supply lead to be plugged into the socket outlet from below the ceiling. The wireway system employed in hardboard ceilings shall be to the approval of the Municipalities Representative.

16. EXCAVATION AND CABLE SLEEVES

The Contractor shall acquaint himself with the position of existing services such as storm water pipes, water mains, power cables, telephone cables, etc. and take the necessary precautions before commencing excavations to prevent disruption of these services. Any damage caused by the Contractor to these services shall be repaired at his cost.

The Contractor shall take the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.
The Contractor shall take the necessary precautions to safeguard existing structures, sewerage works, water reticulation works, roads or other property on the site from any damage or risk of subsidence.
Cable trenches for underground LV cables installed in general areas shall be excavated to a depth of not less than 750mm below ground level and the width shall not be more than 400mm for one or two cables. The minimum cover from the top of the cables to finished ground level shall not be less than 600mm for LV cables and 1000mm for MV cables.

Cable trenches for underground LV cables installed under roads and load bearing areas shall be excavated to a depth of not less than 950mm below ground level and the width shall not be more than 450mm for one or two cables. The minimum cover from the top of the cables to finished ground level shall not be less than 800mm.

The width shall be increased where more than two cables are laid together so that the cables may be spaced at least 150mm apart throughout the run. The bottom of the trench shall be level and clear and the bottom sides free from rocks or stones liable to cause damage to the cables.

Cable trenches may not be backfilled before the cables laid on the bedding have been inspected and the cables have been tested. Cable trench shall be backfilled and properly compacted in layers with suitable hand tampers or mechanical stampers to ensure that there is no subsidence. During compaction the soil may have to be moistened to an optimum moisture content to attain an adequate compaction density. If suitable backfill material is not available at the trenches, the Contractor shall obtain it elsewhere at no additional cost.

All surplus ground and rocks shall be removed from the site of works and this cost be included in the Contractor's tender price.

Tenderers must base their cost of trenching in soft or hard material on the total quantities as indicated in the Bill of Quantities. The actual quantities, based on the applicable number of cables to be laid, will be measured on site during the course of the service and adjustments made according to the price per cubic metre as inserted in the Bill of Quantities by the Tenderer. Payment for the trenching having a greater volume than that specified for the purpose will not be considered except where extra excavations are necessary to by-pass obstacles such as water pipes, drains, large boulder etc. In all such instances the amount of the extra excavations must be agreed upon on site between the Engineer and the Contractor.

The tendered rate shall include full compensation for clearing and grubbing the trench areas and the temporary removal of improvements from the line of the trench, for excavating the trench, preparing the bottom of the trench, separating material unsuitable for backfill, keeping the excavations safe, dealing with any surface or subsurface water, measuring, classification and keeping of all records and for separating topsoil and selected backfill material where necessary.

The rate shall furthermore cover the costs of installing the sand bed and sand cover, backfilling, compacting and disposing of the surplus material.

The materials excavated shall be classified as follows for payment purposes:

Hard material:
Material which cannot be excavated efficiently except with the use of pneumatic tools, blasting or wedging and splitting, and shall include boulders exceeding 0, 15 m^3 in volume.

Soft material:
All material not classified as hard material. Notwithstanding the above classification, all material previously constructed fills, embankments, pavement layers and from above existing services shall be classified as soft material.

The decision of the Municipalities Representative as to the classification of the material shall be final and binding and any objection as to the classification shall be made before the excavation has been backfilled.

The measured items shall include any or all of the following classes of material, which shall be as specified in the Preambles to all Trades:

(1) Excavate in soft material for trenches, backfill, compact and dispose surplus material.

(2) Extra over on item (1) for excavating in intermediate material, compact and dispose surplus Material

(3) Extra over on item (1) for excavating in hard rock, and dispose surplus material.

(4) Extra over on item (1) for using backfill material obtained from sources provided by the Contractor.

All underground sleeves shall, unless where otherwise specified, comprise uPVC pipes.
Where cables cross under roadways, other services and where cables enter buildings, the cables shall be installed in asbestos-cement pipes, earthenware or high density polyethylene pipes.
All the cable access sleeves and manholes as indicated on the drawings and as specified shall be provided by the Main Contractor. It shall be the responsibility of the Contractor to ensure that all the sleeves and manholes are correctly installed.

Suitable large radius or easy bends shall be allowed where sleeves are to terminate in distribution boards or draw boxes. Sleeves terminating in manholes are to be positioned to provide maximum cable bending radius.

The top of all underground sleeves, which are installed in general areas other than roadways and load bearing areas, shall be not less than 600mm below finished ground level. PVC warning tape shall be installed 300 below finished ground level directly above the sleeves.

Where cables cross under roadways or other load bearing areas the cables shall be installed in asbestos-cement pipes, earthenware or high density polyethylene sleeves. In all such cases the top of the sleeves shall be not less than 800 mm below the finished level of the road surface for LV cables and 1000mm for MV cables.

Before backfilling, the ends of all used and unused sleeves shall be sealed with paper and weak cement mix or a suitable non-hardening watertight compound. Suitable nylon draw cords shall be installed in all unused sleeves.

17. CABLES

1000 volt PVC SWA/ECC and 110 Volt ECC cable and accessories shall be in accordance with the relevant SABS specifications to SABS 1507. Copper cables are to be utilized unless otherwise stipulated.

The Contractor shall supply and completely install all distribution cables as indicated on the drawings, and listed in the Schedule of Cables.

The storage, transportation, handling and laying of the cables shall be according to first class practice, and the contractor shall have adequate and suitable equipment and labour to ensure that no damage is done to cables during such operations.

The cable-trenches shall be excavated to a depth of 0,6m deep below ground level and shall be 450mm wide for one to three cables, and the width shall be increased where more than three cables are laid together so that the cables may be placed at least two cable diameters apart throughout the run. The bottom of the trench shall be level and clean and the bottom and sites free from rocks or stones liable to cause damage to the cable.

The Contractor must take all necessary precautions to prevent the trenching work being in any way a hazard to the personnel and public and to safeguard all structures, roads, sewage works or other property on the site from any risk of subsidence and damage.

In the trenches the cables shall be laid on a 75mm thick bed of earth and be covered with a 150-mm layer of earth before the trench is filled in.

All joints in underground cables and terminations shall be made either by means of compound filled boxes according to the best established practice by competent cable jointers using first class materials or by means of approved epoxy-resin pressure type jointing kits. Epoxy-resign joints must be made entirely in accordance with the manufacturer's instructions and with materials stipulated in such instructions. Low tension PVCA cables are to be made off with sealing glands and materials designed for this purpose which must be of an approved make. Where cables are cut and not immediately made off, the ends are to be sealed without delay.

The laying of cables shall not be commenced until the trenches have been inspected and approved. The cable shall be removed from the drum in such a way that no twisting, tension or mechanical damage is caused and must be adequately supported at intervals during the whole operation. Particular care must be exercised where it is necessary to draw cables through pipes and ducts to avoid abrasion, elongation or distortion of any kind. The ends of such pipes and ducts shall be sealed to approval after drawing in of the cables.

Backfilling (after bedding) of the trenches is to be carried out with a proper grading of the material to ensure settling without voids, and the material is to be tamped down after the addition of every 150mm. The surface is to be made good as required.

On each completed section of the laid and jointed cable, the insulation resistance shall be tested to approval with an approved "Megger" type instrument of not less than 500 V for low tension cables.

Earth continuity conductors are to be run with all underground cables constituting part of a low tension distribution system. Such continuity conductors are to be stranded bare copper of a cross-sectional area equal to at least half that of one live conductor of the cable, but shall not be less than 4mm² or more than 70mm². A single earth wire may be used as earth continuity conductor for two or more cables run together, branch earth wires being brazed on where required.

17.1LAYING, JOINTING AND MAKING OFF OF ELECTRICAL CABLES

[The requirements specified hereafter, are aimed essentially at high tension cable but are also valid for low tension cable, where applicable.]

1. The use of the term "Inspector" includes the engineer or inspector of the Municipality or an empowered person of the concerned supervising consulting engineer's firm.

2. No cable is to be laid before the cable trench is approved and the soil qualification of the excavation is agreed upon by the Contractor and inspector.

3. After the cable has been laid and before the cable trench is back-filled the inspector must ensure that the cable is properly bedded and that there is no undesirable material included in the bedding layer.

4. All cable jointing and the making off of the cables must only be carried out by qualified experienced cable jointers. Helpers of the jointers may not saw, strip, cut, solder, etc. The cable and other work undertaken by them must be carried out under the strict and constant supervision of the jointer.

5. Before the Contractor allows the jointer to commence with the jointing work or making off of the cable (making off is recognized as half a joint) he must take care and ensure:

5.1 That he has adequate and suitable material available to complete the joint properly and efficiently. Special attention must be given to ensure the cable ferrules and cable lugs are of tinned copper and of sufficient size. The length of the jointing lugs must be at least six times the diameter of the conductor,

5.2 That the joint pit is dry and that all loose stones and material are removed,

5.3 That the walls and banks of the joint pit are reasonable firm and free from loose material which can fall into the pit,

5.4 That the necessary coffer-dams or retaining walls are made to stop the flow of water into the joint pit,

5.5 That the joint pit is provided with suitable groundsheets so that the jointing work is carried out in clean conditions,

5.6 That the necessary tents or sails are installed over the joint pit to effectively avert unexpected rainfall and that sufficient light or lighting is provided,

5.7 That the necessary means are available to efficiently seal the jointing or cable end when an unexpected storm or cloudburst occurs, regardless of how far the work has progressed,

5.8 That the cables and other materials are dry, undamaged and in all respects are suitable for the joint work or making off,

5.9 That the heating of cable oil, cable compound, plumbers metal and solder is arranged that they are at the correct temperature when required so that the cable is not unnecessary exposed to the atmosphere and consequently the ingress of moisture (care must be taken of overheating)

Flow temperatures of cable oil and compound must be determined with suitable thermometers. Cable oil and compound must not be heated to exceed the temperatures given on the containers and precaution must be taken to ensure that the tin is not overheated in one position. The whole mass must be evenly and proportionally heated.

(Temperatures of solder and plumbers metal may be tested with brown paper (testing time: 3 seconds). The paper must colour slightly - not black or burnt).

6. Before the paper-insulated cables are joined, they must be tested for the presence of moisture by the cable jointers test. This consists of the insertion of a piece of unhandled insulated impregnated paper tape in warm cable oil heated to a temperature of 130 ± 5°C.

Froth on the surface of the oil is an indication that moisture is present in the impregnated insulation and the amount of the froth gives an indication of the moisture present.

7. If the cable contains moisture or is found to be otherwise unsuitable for jointing or making of the inspector is to be notified immediately and he will issue the necessary instruction to cope with the situation.

8. The joint or making off of paper insulated cables must not be commenced during rainy weather.

9. Once a joint is in progress the jointer must proceed with the joint until it is complete and before he leaves the site.

10. The jointer must ensure that the material and his tools are dry at all times, reasonably clean and absolutely free from soil.

11. Relating to the jointing of the cable the following requirements apply:

11.1 All jointing must be carried out in accordance with recognized and tried techniques and comply strictly with the instructions given by the supplier of the jointing kit.

11.2 The cables must be twisted by hand so that the cores can be joined according to the core numbers. If necessary the cable is to be exposed for a short distance to accomplish this. Under no circumstances may the cores in a joint be crossed so as to enable cores to be joined according to the core numbers. If it is not possible to twist the cables so that the preceding requirements can be met, then cores are to be joined in the normal way without any consideration of the core numbers.

11.3 Normally the cables will have profile conductors. The conductors shall be pinched with gas pliers to form a circular section, bound with binding wire so that they do not spread, and then tinned before jointing.

11.4 Jointing ferrules, the length of which are at least 6 times the diameter of the conductors, must be slid over the conductor ends to be joined and pinched tightly. Then they are soldered by means of the ladle process whilst being pinched further closed.

Use resin only as a flux. The slot opening in the ferrule must be completely filled, including all depressions.

Remove all superfluous metal with a cloth dipped in tallow. Work during the soldering process must be from top to bottom. Rub the ferrule smooth and clean with aluminum oxide tape after it has cooled down to ensure that there are not any sharp points or edges.

NB: The spaces between the conductor strands must be completely filled by soldering process and must be carried out quick enough to prevent the paper insulation from burning or drying out unnecessarily.

11.5 After the ferrules have been rubbed smooth and clean, they and the exposed cores must be treated with hot cable oil (110°C) to remove all dust and moisture. These parts are to be thoroughly basted with the oil.

11.6 The jointer must take care that his hands are dry and clean before the joint is insulated. Also the insulating tape which is to be used must first be immersed in warm cable oil (110°C) for a sufficient period to ensure that no moisture is present.

11.7 After the individual cores have been installed they must be well basted with hot cable oil and again after the applicable separator and/or belt insulation tape is applied before the lead joint sleeve is placed in position.

11.8 The lead joint sleeve must be thoroughly cleaned and prepared before it is placed on the cable and must be kept clean during the whole jointing process. Seal the filling apertures of the sleeve with tape until the sleeve is ready for compound filling.

11.9 The plumbing joints employed to solder the joint sleeve to the cable sheath, must be cooled off with tallow and the joint sleeve is to be filled with compound while it is still warm. Top up continuously until the joint is completely filled to compensate for the compound shrinkage.

11.10 The outer joint box must be clean and free from corrosion. After it has been placed in position it must be slightly heated before being filled with compound. Top up until completely full.

12. As far as cable end boxes are concerned the requirements as set out above are valid where applicable.

18. DISTRIBUTION BOARDS & SWITCHGEAR

In addition to clause 14 and clause 15 of Part 1 of this specification the following shall also be applicable to switchboards required for this service.

The Contractor shall supply and install the distribution boards as indicated on the drawings and listed in the distribution Board Schedule. All distribution boards & switchgear shall comply with the quality specification in Part 3 of this specification, and be approved by the Employer's Electrical Engineer.

All kiosks and distribution boards tested prior to delivery to site. Testing shall be done in accordance to the relevant SANS/SABS standard for manufacture of kiosks and distribution boards. Testing certificates per distribution or kiosk to be included in the hand over file.

All kiosks and distribution boards with a short circuit rating of 10kA and higher to be type tested according to SANS regulations. Type test certificates to be included in the handover file. Any additional costs for testing is to be included within the supply rate of the specific distribution board or kiosk.

The following types of distribution boards are required for the service:

18.1	DB-GH	:	Guard House	-	Flush Board

19. SCHEDULE OF LIGHT FITINGS

The light fittings and accessories are to be according to the quality specifications in Part 3 and shall be approved by the Engineer/Municipality prior to any purchase.. All luminaires to include a minimum of 4 year warranty. All items required to meet the specifications to be included within the supply rate of each fitting.

Type S1:

(1x41 watt) LED surface mount, 1578 mm Length, CRI>80, Operating temperature <= 40 degrees Celsius, 4000k Colour Temperature, Power Factor greater than 0.9, Injection Moulded gasket, IP66 Rated, 10kV surge protection, Flicker free driver, Lumen Output - 6903 lm, Operating voltage: 230 V (+- 10%) @ 50hz, UV stabilized polycarbonate diffuser with internal

satine acrylic diffuser (No LED dots), Stainless steel 316 latches and fastners, 6 A plug top with 3m Cabtyre, Light fitting to have SANS/SABS approved mark.

Type B1:

(1x17 watt) LED surface mount dome type bulkhead, 280 mm diameter, white trim, CRI>80, Operating temperature -20 to 35 degrees Celsius, 4000k Colour Temperature, Power Factor greater than 0.9, IP65 Rated, 10kV surge protection, Silicon sponge gaskets, Flicker free/constant current driver, Lumen Output - 2620 lm, Operating voltage: 230V (+- 10%) @ 50hz, High pressure die cast aluminum base, High impact and UV resistant anti discoloring diffuser, Stainless steel 316 latches and fastners, Light fitting to have SANS/SABS approved mark.

21. SCHEDULE OF ELECTRICAL ACCESSORIES

REF	LOCATION	DESCRIPTION	REV
Ls	**LIGHT SWITCHES**		
Ls1	Genaral indoor, flush	16 A,1 lever, 250 V SABS in 100x50x50 steel box. Covers to be included. Toggle to be red.	0
Ls2	General indoor, flush	16 A,1 lever, 2-way, 250 V SABS in 100x50x50 steel box. Covers to be included. Toggle to be red.	0
Pp	**PLUG POINTS**(SSO's unless otherwise shown)		
Pp1	Gen. indoor, flush SSO. Type NP	16 A, 250 V SABS in 100x100x50 steel box, Combination plug point as per SANS 164-1 & SANS 164-2 - seperately switched. Covers to be included. Toggles to be red.	0
Ip	**ISOLATOR POINTS**		
Ip1	General indoor, flush	20 A, 250/400 V, DP/TP SABS in 100x100x50 steel box, Weatherproof isolators to be of enclosed sealed type (NWI).	0
Ip2	General indoor, flush	30 to 60 A, 250/400 V, DP/TP SABS in 100x100x50 steel box, Weatherproof isolators to be of enclosed sealed type (NWI).	0
Notes:			
1. All accessories to be SABS approved.			
2. SSO - Switched Socket Outlet			
3. Samples of equipment to be provided for client approval prior to all equipment being purchased.			

22. SCHEDULE OF DISTRIBUTION BOARDS & KIOSKS

The front panels of normal supply, standby power and no-break supply sections shall be painted in distinctive colours as follows:

Normal supply : Light Orange or White, colour B26 of SANS 1091.

BOARD	TYPE	PANEL(Color)	FAULT LEVEL (kA)
DB-GH	Flush, with lockable door	White (White inner cover plate)	5

23. SUMMARY OF SWITCHGEAR AND CIRCUITS

The indicated fault current rating (kA) is the minimum value that the switchgear must comply with for connecting to the busbars of the respective panels-distribution boards.

Labelling: The Contractor shall allow to supply and install engraved (Black on White) labels on to the board with the following information:

- Supply source information
- Supply source cable size
- Board Name.
- Respective Distribution Boards fault level.

All distribution boards & switchgear shall comply with the quality specification in Part 3 of this specification and be approved by the Employer's Electrical Engineer.

23.2. Distribution Boards

General: Distribution boards shall be flush mounted (or otherwise specified) and shall be manufactured from 2mm thick zinc plated steel (IP54 rated or otherwise stated). Doors shall be lockable. Contractor to allow 30% Spare way on all Distribution Boards. Distribution boards to include suitably rated bus bars. All fuses to be of the modular replacement type.

All distribution boards to be installed with phase indicator pilot lights (per phase).

The Contractor shall provide shop drawings and shall only manufacture the Distribution Boards upon written approval from the Electrical Engineer.

Contractor is to refer to the electrical schematics for detailed information such as required switchgear, kA rating, IP rating etc...

24. IDENTIFICATION

Labels indicating the circuit number shown on the 'As-built' record drawings shall be provided on the inside of all cover plates. The label shall be permanently fixed and shall indicate the dB from which it is fed and the circuit number i.e. dB -1/L2.

All isolators, dedicated socket outlets, telephone and TV outlet boxes and junction/terminal boxes shall be labelled using engraved plastic sandwich type labels fixed by means of epoxy adhesive.

All cables shall be labelled using approved durable labels. Labels shall be provided at the distribution boards as well as on both sides of underground sleeves crossing roadways and hardened areas.

Fixing equipment and materials shall be selected and engineered to suit the climatic and environmental conditions found on site. Wherever possible, special precautions shall be taken to avoid contact between dissimilar metals in order to prevent corrosion. Stainless steel fixings in aluminium housings shall be by means of special stainless steel 'helicoil' inserts to prevent corrosion and the screw from being fastened to the housing. Contact between aluminium and concrete surfaces shall also be avoided.

Light weight equipment mounted against walls or concrete ceilings may be installed with suitable wall plugs to the approval of the Engineer. Holes in joints between brick walls will not be permitted. The depth of the hole shall be equal to the length of the plug plus the thickness of the plaster.

Mounting of equipment against wood shall be done by means of appropriately sized greased screws and against board ceilings inaccessible from the back with toggle screws.

All heavy weight equipment shall be fixed to brick or concrete by means of expansion bolts. All exposed parts of the bolts shall be painted to have the same colour finish as the equipment. All expansion bolts used outdoors shall be hot dip galvanised or stainless steel. Electro-plated galvanised expansion bolts will not be permitted outdoors.

All mounting brackets for outdoor use shall be hot dip galvanised steel after manufacture. All fixings used outdoors shall be hot dip galvanised, stainless steel or brass as appropriate. No electro-plated galvanised steel fixings shall be used outdoors.

The Contractor shall adequately label all switches, socket outlets, isolators, telephone and TV outlet boxes and all junction/terminal boxes using engraved plastic sandwich type labels fixed by means of epoxy adhesive. The circuit reference numbers indicated on the layout drawings shall be used on the labels.

25. COMPLETION OF WORKS

Completion of works will occur and delivery shall be given only after the following procedure has been certified by the Municipalities Representative as having been carried out in accordance with the Specification:

1. After the defects are made good and approval of the Municipalities Representative is obtained, physical completion has been reported to the Municipalities Representative by the Contractor and the Municipalities Representative has given approval for "start-up".
2. "Start-up" has taken place.
3. Commissioning and testing has taken place as specified and test results have been witnessed (where required), recorded and finally approved by the Municipalities Representative.
4. Spares as specified have been handed over to the Municipalities Representative.
5. Three copies of indexed loose leaf manuals containing complete Operating Instructions and Maintenance Manuals have been furnished to the Municipalities Representative after approval by the Municipalities Representative, for all mechanical and electrical systems, equipment and controls for all equipment or systems specified under this Contract.

26. TESTING, COMMISSIONING & INSPECTIONS

On completion of the entire installation or any particular section thereof, as may be decided by the Engineer, tests shall be carried out in full accordance with the current edition of the SANS 10142 "Code of Practice for the Wiring of Premises", in the presence of the Engineer or his authorized Representative.

The Contractor should note that where applicable at least the following tests (but not limited to) must be carried out:

1. Insulation test
2. Continuity test
3. Loop Line Earth Impedance test
4. Polarity test
5. Earth Leakage Circuit Breaker test
6. Any further test to meet the local Supply Authority requirements or as deemed necessary by the Engineer.
7. Earth termination test

Note:

- All instrumentation necessary for testing shall be provided by the Electrical Sub-Contractor.
- The results of the above tests must be clearly recorded, signed and handed to the Engineer.
- Once the Engineer has inspected the complete installation and satisfied himself that all testing has been completed and the Contract is complete in all respects, may the Engineer be approached in writing with the above documentation with a view to arranging a hand- over date.
- On completion of the Contract, the Electrical Sub-Contractor shall provide the Engineer with a completed and signed Certificate of Compliance for Electrical Installations for all distribution boards as required by the Occupational Health and Safety Act as amended.
- **Inspections by the Engineer will take place on a sampling basis only. The Engineer is not responsible to ensure that the Contractor meets with the requirements of the Specification, but will assist the Contractor in an effort to identify problem areas at an early stage. At no time will an inspection by the Engineer alleviate the Contractor of his responsibility to provide the Employer with a Contract Works which conforms in all respects with the requirements of the Specification and drawings.**
- The Contractor is required to balance the load as equally as possible over multi-phase supplies.
- The mandatory “Certificate of Compliance” shall be issued by the Contractor to the Supply Authority, with a copy to the engineer prior to first delivery being taken.
- The installation shall be tested by the Contractor as the service progresses or as required by the Head: Works and upon completion, for earth continuity and insulation. The final test before the taking over of the installation shall be made in the presence of the engineer.

- On all completed new work or where specifically called for in the Tender Document, the Contractor shall, on completion of the works, submit to the Client representative, a marked up site plan indicating the exact underground cable reticulation.
- Upon successful completion of all testing the Contractor shall submit a fully completed test report together with a Certificate indicating that the installation fully complies with the Specification and all relevant statutory requirements.

27. TRAINING

After successfully testing and commissioning the installation, the Contractor will be required to thoroughly train and instruct at least two Operators/Supervisors designated by the school in the correct use, operation and supervision of the Electrical installation, School Siren installation, Generator installation, Lightning Protection installation and Intruder Alarm installation. The Contractor shall allocate a competent member of his staff for this purpose and shall allow adequate time for this in his price.

A comprehensive operator-training programme shall be provided, and shall cover all aspects of the installations so as to provide a first line local support to the staff, both operational and managerial. The training sessions shall comprise lectures and on-site (hands-on) demonstrations, and shall conduct over a minimum 2-day period. The Contractor shall provide a training plan and syllabus to the Municipalities Representative for approval. Approval of the training plan and syllabus shall be a condition for issue of a Certificate of Practical Completion for the installation. No training shall commence without the Municipalities Representative's approval of the final draft Operating and Maintenance Manual for the installation. Training registers are to signed by all members receiving training and a copy of all signed registers are to be included in the respective handover files.

The training shall include the following topics as a minimum:

1. Hardware-
(a) Overview and functioning of system and equipment.
(b) Network and cabling.
(c) Components and field replacement.
(d) System maintenance and specific tasks related to preventative maintenance.
(e) Interpretation and understanding of the Operating and Maintenance Manuals, with specific reference to requirements in cases of corrective and breakdown maintenance.

2. Support-
(a) Trouble shooting problems /queries.
(b) Support programme and procedures.
(c) Support communications.

Training certificates shall be issued at the end of the training, when the Contractor is satisfied that the persons trained have an adequate understanding of how the system functions, and are able to operate the system effectively. Copies of the certificates shall be included in the operating and maintenance manual.

28. OPERATING, MAINTENANCE AND INSTRUCTION MANUALS

The Contractor shall be responsible for the compilation of a complete set of Operating, Maintenance and Instruction Manuals for the entire Electrical installation, Intruder Alarm installation, Generator installation, Lightning Protection installation and School Siren installation.

The manual shall be bound in hardcover plastic-coated A4 lever-arch files as per 'Bantex' or similar and approved. Sections of the manuals shall be clearly partitioned using labelled coloured plastic sheets. Pamphlets, bound leaflets/booklets. And drawings shall be placed in clear plastic pockets.

The manual shall contain at least the following headings:

1. Introduction
   (a) Scope of the manual

(b) General arrangement of the manual
(c) Description of installation
(d) Specifications

2. Schedule of equipment installed with pamphlets, names of Agents and Suppliers.
3. Parts and components list
4. Operating procedures
5. Maintenance
   (a) Purpose of maintenance
   (b) Preventative maintenance
   (c) Trouble-shooting
   (d) Planned service maintenance programme

6. Breakdown maintenance and repair, and name, address and telephone number of Contractor and after hours service.

7. Appendices including testing, commissioning data and training registers.

8. Drawings and diagrams

A draft copy of each Operating, Maintenance and Instruction Manual shall be submitted to the Municipalities Representative for approval. The manual will be reviewed and checked by the Municipalities Representative and returned to the Contractor with comments, where necessary. The Contractor shall make the necessary changes and amendments to the manual to incorporate the Municipalities Representative's comments.
The final draft copy of each Operating, Maintenance and Instruction Manual shall be submitted to the Municipalities Representative at least one week prior to commencement of testing on commissioning. This set of manuals will not be accepted without the Contractor's verification of the information contained in the manuals and the professional language editing thereof. The Municipalities Representative shall return the manual to the Contractor, who shall make the final corrections.

The Contractor shall include all test certificates and all details of the Electrical installation. All such information and certificates shall be to the approval of the Municipalities Representative. Electronic copies of the final manual shall be handed over to the Municipalities Representative upon approval of the Operation, Maintenance and Instruction Manual.

Approval of final Operating, Maintenance and Instruction Manual shall be a prerequisite for issuing of a Certificate of Practical Completion for the installation.

The Contractor shall also provide copies of CD's containing all the "As-Built" record drawings of the complete Electrical installation.

PART 3: QUALITY SPECIFICATION FOR MATERIALS AND EQUIPMENT OF ELECTRICAL INSTALLATIONS

CONTENTS

PART 3: QUALITY SPECIFICATION FOR MATERIALS AND EQUIPMENT OF ELECTRICAL INSTALLATIONS

1 DISTRIBUTION BOARDS

a) GENERAL

The Contractor shall supply and install the new distribution boards as indicated on the drawings and in the distribution board schedules. All distribution boards shall comply with the General Specification for Electrical Installations, and be to the approval of the Municipalities Representative. All boards shall be to the approval of, and shall comply with, the Standards and Regulations as well as the

Requirements of the Supply Authority. All distribution boards shall be delivered complete with switchgear, busbars, internal wiring, dummy circuit breakers, legend card and holder, labels etc. in the positions indicated on the drawings.

It shall be the responsibility of the Contractor to provide the board manufacturer with all the relevant information regarding the details of the space and access of the rooms, in which the boards are to be accommodated, as well as entry details of cables, pipes and trenches, etc., to ensure the boards are correctly manufactured.

Boards with fault level ratings less than 10 kA shall comply with SANS 1765 and fault levels equal to or greater than 10 kA with SANS 60439-1. Surge arresters for use in distribution boards shall comply with SANS IEC 61643-1.

Distribution boards shall be as indicated on the DB schedules and single line diagrams and shall comply with SANS 1765 and SANS 60439-1.

The Contractor shall implement the manufacture of distribution boards as soon as possible after being appointed to ensure their timely delivery to site.

The Contractor shall submit DB workshop drawings to the Municipalities Representative for reviewing before the boards are to be manufacture. The boards are to be inspected at the manufacturer's premises by the Municipalities Representative and the Contractor before they can be delivered to site.

Distribution boards shall be manufactured by a reputable firm which is a specialist in the field and who shall install and fit the switchgear and equipment and carry out all the internal wiring.

The boards shall be manufactured from pre-galvanised sheet steel with a epoxy paint with colour finish to the Architect's approval. The interior of boards shall have a white epoxy paint finish and the base/plinth frame on free-standing boards shall be with a corrosion resistant black paint.

All switchboards shall be of ample size to accommodate the specified switchgear and provide space for future switchgear. For every 4 (or part of 4) 5kA circuit-breakers on a switchboard, space for an additional 5kA circuit breaker shall be allowed unless future space requirements are dearly specified. For circuit breakers above 5kA, this factor shall be 15 %. The clearance between adjoining switchgear openings shall be as specified in heading F of this section.

The maximum allowable height of free standing switchboards is 2,2 m. Cubicle type boards may be up to 2,4 m high if they can be fully dismantled into individual cubicles. Where, due to space restrictions, a board exceeds 2,4m in height, equipment not normally requiring access, shall be installed in the top section, enabling equipment normally requiring access to be installed lower down in the board. All other specified external dimensions for switchboards shall be strictly adhered to. If the clearances specified heading F of this section cannot be adhered to as a result of restricting external dimensions, the Contractor shall obtain the approval of the Municipality before manufacturing the switchboards.

All switchboards shall be rendered moisture proof and vermin proof and shall be adequately ventilated. Refer to heading D of this section.

The load shall be balanced as equally as possible across multiphase supplies

b) CONSTRUCTION OF FLUSH MOUNTED SWITCHBOARDS

1. Standard

Flush mounted switchboards shall comply fully with SABS 1180, part I. Unless the depths of the switchboards are specified, the depths shal! be determined in accordance with par. 6.

2. Expanded Metal

Where switchboards are to be built into 115 mm thick walls, expanded metal shall be spot-welded to the rear of the bonding trays. The expanded metal shall protrude at least 75 mm on each tray side to prevent plaster from cracking.

3. Knock-outs

Knock-outs shall be provided in the top and bottom ends of each switchboard tray to allow for the installation of conduits for the specified and future circuits. Knock-outs shall be provided for an equal number of 20 mm and 25 mm dia. conduits.

4. Panel

Front panels shall have machine punched slots for housing the specified and future flush mounted switchgear. The distance between the inside of the closed doors and the panel shall not be less than 20 mm. No equipment nay be mounted on the panel unless the panel is permanently hinged to the switchboard frame.

5. Fixing of Front Panels

The front panel shall be secured to the architrave frame by means of 6mm studs and chromium-plated hexagonal domed nuts, hank nuts or captive fasteners. Alternatively the panel may be secured to the architrave frame by means of two pins at the bottom and a latch or lock at the top of the panel. Self-tapping screws will not be allowed. All front panels shall be provided with a minimum of one chrome plated handle.

6. Door Handles and Catches

Switchboard doors shall be equipped with handles and catches. Locks shall only be provided when specified. In all cases where lockable doors are required and in all cases where the switchboard doors are higher or wider than 450 mm, handles consisting of a push-button-and-handle combination with spring loaded catch or rotary handle-and-catch combination shall be installed. Switchboard doors smaller than 450 mm in height and width may be equipped with spring loaded flush mounted ring type latches. Square key operated catches are not acceptable unless specified.

c) CONSTRUCTION OF SURFACE MOUNTED SWITCHBOARDS

1. Standard

Surface mounted switchboards shall comply with SABS 1180. Part II.

2. Switchboard Tray

Surface mounted switchboards shall be equipped with a 1,6mm minimum sheet steel reinforced tray. Suitably braced and stiffened to carry the chassis, door and equipment. Lugs to secure the switchboard to a vertical surface shall be provided.

3. Construction

All joints shall be welded or securely bolted. The tray shall be square and neatly finished without protrusions. The front tray sides shall be rounded with an edge of at least 20mm to accommodate flush doors.

4. Chassis

A sheet steel chassis for the mounting of equipment shall be bolted to the tray and shall comply with the requirements of heading F of this section.

5. Front Panel and Door

Doors shall fit flush in the tray when closed.

6. Dimensions

Unless the depth of the switchboards is specified, the dimensions shall be determined in accordance with the requirements of heading F of this section.

d) CONSTRUCTION OF FREE STANDING SWITCH BOARDS

1. Framework

A metal framework for free standing switchboards shall be manufactured from angle iron. Channel iron or 2mm minimum folded metal. A solid U-channel base frame, sufficiently braced to support all equipment and span floor trenches and access holes shall be provided. Switchboards shall be of cubicle design with 2mm side panels forming divisions between cubicles. The maximum allowable cubicle width is 1,5m. Joints shall be non-continuously butt-welded. Welds shall be ground smooth and the joint wiped with plumber's metal in order to provide a smooth finish. Switchboards wider than 2m shall be fitted with screwed eye-bolts attached to the framework to facilitate loading and transportation of the board.

2. Rear and Side Panels

The rear panels shall be removable and shall be manufactured from 2mm minimum sheet steel. The panels shall have returned edges which are recessed in the frame or which fit over lips on the switchboard frame. The panels shall be secured to the frame by means of studs and chromium-plated hexagonal domed brass nuts or hank nuts or captive fasteners equal or similar to "DZUS" or "CAMLOC". Where switchboards are intended for installation in vertical building ducts or against walls, the rear and side panels may consist of a single folded sheet which is either bolted or welded to the frame or which forms part of the folded metal frame.

3. Front Panels

The front panels of floor standing switchboards shall preferably be hinged except where flush mounted equipment prevents this

The hinged front panels shall have a dished appearance with 20mm upturns which fit over a lip on the switchboard frame. Alternatively the hinged panels shall have folded edges and shall be fitted flush or slightly recessed in the switchboard frame. The latter method shall be used where doors are required. Corners shall be welded and smoothed.

The panels shall be of 2mm minimum sheet steel with machine punched slots to allow for the flush mounting of instrumentation, switchgear toggles and operating handles. A minimum clearance of 50mm shall be maintained between the rear of equipment mounted on the panels (taking into account terminals or other projections) and the frame and chassis of the switchboard. Separate panels shall preferably be provided for the mounting of instrumentation and for covering flush mounted switchgear. Enclosed switchgear with front panels e.g. combination fuse-switch units, may be flush mounted in the board in lieu of separate hinged panels.
Hinged panels shall be suitably braced and stiffened to carry the weight of flush mounted equipment and to prevent warping.

Hinged panels with flush mounted equipment and panels higher than 600mm shall be supported by hinges of adequate strength to ensure smooth and reliable operation. 16mm pedestal or similar heavy duty hinges with single fixing bolts may be used on panels smaller than 600mm. On the larger panels long pedestal type hinges with two fixing bolts per hinge are preferred. Piano hinges are not acceptable for this application.

A tubular chromium-plated handle shall be fitted on each panel. The handle may be omitted if "DZUS" or "CAMLOC" fasteners are used.

Blanking plates shall be fitted over slots intended for future equipment. These plates shall be fixed in a manner which does not require the drilling of holes through the front panel. Dummy circuit-breakers may be fitted where applicable.

Front panels containing live equipment such as instrumentation or control switches, shall be bonded to the switchboard frame with a braided copper earth trap with an equivalent cross-sectional area of at least $4mm^2$.

4. Securing of Front Panels

Hinged panels shall be secured in position by means of square key operated non-ferrous fasteners designed to draw the panels closed or similar quick-release fasteners. Self-tapping screws are not acceptable. Where non-hinged removable panels are specified, they shall be secured in position by means of 6mm studs and hexagonal chromed brass dome nuts and washers or hank nuts. Non-hinged removable panels may alternatively be secured in position by means of two pins at the bottom and a latch or lock at the top.

5. Chassis

A suitably braced chassis for the mounting of switchgear and equipment shall be firmly secured to the frame of the switchboard. The chassis shall be designed so that the switchgear can be installed in accordance with par. 6. Circuit-breakers and isolating switches which are not of the moulded-case air-break type and the insulators of busbars for ratings of 200 A and more may be secured directly to the framework. (Refer to heading F of this section).

6. Doors

Doors need only be provided when specified. Doors shall be arranged in multi-tiered fashion to allow for the logical grouping of equipment in accordance with heading F of this section.

Doors shall have a dished appearance with a minimum of 20 mm upturns which fit over a lip on the switchboard frame or shall fit flush in the switchboard frame. Corners shall be welded and smoothed.

Doors shall be of aluminum sheet steel with machine punched slots to allow for the flush mounting of instrumentation, control and protection equipment. Switchgear shall be flush mounted in the front panels behind the doors unless specified to the contrary. A minimum clearance of 50mm shall be allowed between the rear of equipment mounted on doors (including terminals and projections) and the frame, front panel and chassis.

Doors shall be suitably braced and stiffened to carry the weight of the equipment and to prevent warping.

At least three hinges shall be provided on doors higher than 1,2m.

Doors shall be fitted with handles consisting of a pushbutton-and-handle combination with spring loaded catch or a rotary handle-and-catch combination. Flush mounted ring type handles or square key operated latches are not acceptable. The same key shall fit all locks on the switchboard in cases where locks are required.

Doors shall be fitted with hypalon or neoprene seals.
Doors containing any electrical equipment shall be bonded to the switchboard frame with a braided copper earth wire with an equivalent cross-sectional area of at least 4mm².

7. Sections

For ease of transportation and to facilitate access to the allocated accommodation, switchboards may be dismantled into cubicles or sections. Each section shall be rigidly manufactured to ensure that damage to the switchgear will not occur during transportation and handling. Where required, switchboards shall have temporary wood or steel bracing to protect switchgear and facilitate handling.

8. Grouping of Switchgear

The switchgear shall be logically arranged and grouped as described in heading F of this section.

Depending upon the number and size of components, a common front panel may be installed over one or more groups of equipment. All equipment shall be installed in accordance with the requirements of heading F of this section.

9. Cable Gland Plate

A cable gland plate shall be installed across the full width of each power cubicle at a minimum height of 300mm above the bottom of the switchboard to house the cable glands. A Steel cable channel or other approved support shall be provided to carry the weight of the cable and remove mechanical stress from the cable glands. A minimum distance as required by the bending radius of outgoing cables shall be provided between the lowest terminals of major equipment and the gland plate.

10. Ventilation

Switchboards shall be property ventilated, especially cubicles containing contactors, transformers, motor starters, lighting dimmers and other heat producing equipment. Louvres shall be fitted to provide adequate upward or cross ventilation. All louvres shall be vermin proofed with 1,5mm brass mesh or perforated steel plate internally spot welded over the louvres. The internal ambient temperature shall not exceed 40 C.

11. Vermin Proofing

Free standing boards shall be protected against vermin, especially from below- where cables have to pass through the gland plate, rubber grommets shall be provided and enough non-hardening compound shall be delivered with the board so that these holes can be sealed properly after installation of the cables.

e) CONSTRUCTION OF MAIN LOW TENSION SWITCHBOARDS

Main low tension switchboards and sub-main low tension switchboards heavily equipped shall comply with par. D.1 to D.11 as well as the following exceptions or additions:

These boards shall be fully extensible with removable busbar cover plates in the side panels.

Doors shall not be supplied unless specifically called for.

Switchgear and equipment shall be installed in accordance with the requirements of heading F of this sections.

Provision for metering equipment shall be made in accordance with requirements of local authorities where applicable.

f) MOUNTING OF EQUIPMENT

1. Mounting

The mounting of equipment shall comply with SABS .1180 where applicable. Equipment to be mounted on the chassis shall be mounted by bolts, washers and nuts or by bolts screwed into tapped holes in the chassis plate. In the latter case the .minimum thickness of the chassis plate shall be 2,5 mm. The latter method shall not be used where boards will be subject to vibration or mechanical shocks. Self-tapping screws will not be accepted.

2. Space Requirements

In designing the switchboards the following requirements shall be strictly adhered to:-

- A minimum of 50 mm between any piece of equipment and the frame or internal partitioning. This minimum space is required on all sides of the equipment. In the case of a single row of single-pole circuit-breakers the spacing on one side row may be reduced to 25 mm if the incoming side of the circuit-breakers is busbar connected.

- A minimum of 75 mm between horizontal rows of equipment. The maximum outside dimensions of equipment shall be considered.

- Circuit-breakers up to a fault rating of 10 kA may be installed adjacent to each other. For higher ratings a minimum of 40 mm shall be allowed between circuit-breakers or isolators.

- Sufficient space shall be provided for wiring allowing for the appropriate bending radius.

- Space for future equipment shall be allowed. The chassis of flush mounted and smaller surface mounted boards shall be mounted in accordance with SABS 1180. For all free standing switchboards and surface mounted switchboards where the main switch rating exceeds 100 A (triple-pole), space for wiring shall be provided between the chassis and tray. This space shall be adequate to install the supply cable behind the chassis and terminate on the main switch without sharp bends in the cable cores.

3. Grouping of equipment

Equipment shall be arranged and grouped in logical fashion as follows:

- Main switch - to be installed either at the top or bottom of the board.

- Short circuit protection equipment - fuse gear or fuse-switches.

- Change-over contactors or other contactors controlling the supply.

- Motor supplies.

- Fuse-switches for outgoing circuits.

- Other circuits and equipment.

Where a portion of the equipment on the switchboard is supplied from a standby power source, the change-over contactor and the associated equipment shall be grouped in a separate compartment.

Where earth leakage units are required, the associated circuit-breakers shall be installed adjacent to the unit.

4. Mounting of Circuit-Breakers

All moulded-case circuit-breakers shall be flush mounted with only the toggles protruding. Miniature circuit-breakers may be installed in clip-in trays mounted on the frame. All other circuit-breakers shall be bolted to the chassis. Special provision shall be made for large main switches when designing the framework. Care shall be exercised that the rear studs of circuit-breakers are properly insulated from the steel chassis. Where necessary, insulating material shall be installed between the rear studs and the chassis. Circuit-breakers shall be installed so that the toggles are in the up position when "ON" and down when "OFF".

5. Instrumentation

All metering instruments shall be flush mounted in the front panel or door. The rear terminals of instruments mounted on doors shall be covered with an insulating material to prevent accidental contact. Current transformers for metering shall be mounted so that the rating plate is clearly visible. Fuses for instrumentation shall be mounted in an easily accessible position and clearly marked.

6. Mounting of Fuses

- Fuse holders shall be mounted semi-recessed in the front panel so that fuses can readily be changed without removing the front panel. Busbar mounted fuses for instrumentation shall be used as far as possible.

- Where equipment requiring fuses is specified on a board (fuse switches etc), a ruling shall be obtained from the Municipality on the quantity of spare fuses to be provided.

7. Equipment in Main Boards

Equipment in main low tension switchboards and sub-main boards shall be grouped in individual compartments. Equipment shall be installed as follows:

- Rack-out type air circuit-breakers shall be mounted in the bottom section, flush behind the panel with the handle only protruding. If this is not possible, the panel shall be omitted and the air circuit-breakers installed behind a door.

- If the main switch is a moulded-case circuit-breaker or isolator it shall be flush mounted.

- Contactors controlling the supply shall be installed behind separate front panels.

- All metering, protection and indicating equipment shall be clearly visible from the front of the board. Current transformer ratios and multiplication factors shall be clearly marked. Where doors are specified the equipment shall be installed flush in the doors and covered as described in par. 6.6.

- All circuit-breakers and fuses (with the exception of fuse-switches) may be grouped together behind one or more panels.

- Fuses or fuse-switches providing back-up protection for circuit breakers, shall be grouped with the associated circuit-breakers. Exposed surfaces effuse-switches shall be of the same finish and colour as the rest of the board where practical.

8. Standby Supplies

- Where standby power from a diesel-generator set or other sources is available and has to be connected to some of the equipment on a switchboard, the switchboard shall be divided into separate sections with sheet metal divisions to isolate standby power and mains power sections.

- Standby and normal supply shall each have its own incoming isolator or circuit-breaker.

- The two sections of the switchboard shall be labelled "ESSENTIAL" and "NON-ESSENTIAL" respectively.

The front panels of standby and no-break supply sections shall be painted in distinctive colours as follows:

- Normal supply "LIGHT ORANGE", colour B26 of SABS 1091

- Standby power "SIGNAL RED", colour All of SABS 1091

- No-break supply "DARK VIOLET", colour F06 or "OLIVE GREEN". colour H05 of SABS 1091

g) BUSBARS IN SWITCHBOARDS

1. Application

- Busbars shall be manufactured of solid drawn high conductivity copper with a rectangular cross-section in accordance with SABS 784, SABS 1195 and BS 159 and BS 1433, where applicable.

- Although SABS 784 refers only to overhead or rising busbars, busbars in switchboards shall comply with applicable sections of this specification especially as far as insulation and clearance values, creepage distance, joints, insulation resistance, dielectric strength, deflection test, absorption resistance and rated short time withstand current are concerned.

2. Busbars shall be supplied for the following applications:

- Distribution of supply voltage.
- Connection of equipment with ratings exceeding the current rating of 70mm² conductors (heading H point 6.).
- Connection of outgoing circuits with current ratings in excess of that allowed for 70mm² conductors.
- Collector bars for parallel cables (heading H point 1).
- Connection bars for neutral conductors.
- Earth busbars.
- Connections to miniature circuit-breakers (heading H point 6).

h) WIRING

1. Cabling

Cables connected to incoming or outgoing circuits shall be terminated on the gland plate supplied for this purpose. (Refer heading D point 9). Power cables up to and including 70mm² may terminate on clamp type terminals where the clamping screws are not in direct contact with the conductor. Connection to the equipment can then be made with cables that are similarly connected to the clamp terminal. All power cables larger than 70mm² terminate on busbars that are connected to the associated equipment. Parallel incoming or outgoing cables shall be connected to a collector busbar without crossing the conductors.

2. Terminal Strips

External wiring for low voltage, control, interlocking, alarm, measuring and DC circuits shall terminate on numbered wiring terminals complying the with Municipalities standard specification for "WIRING TERMINALS", Section C9. The correct terminal size as recommended by the manufacturer for each conductor to be connected shall be used throughout. The terminal numbers shall appear on the wiring diagrams of the switchboard. Terminals for power wiring shall be separated from other terminals. Terminals for internal wiring shall not be interposed with terminals for external circuits. All connections to terminals shall be identified as described in par. H.8. Where switchboards consist of separate sections, the control wiring passing between sections shall be terminated on strips in each section so that control wiring can be readily re-instated when reassembling the board.

3. Current Ratings

The current rating of conductors for the internal wiring shall be sufficient for the maximum continuous current that can occur in the circuit. This value shall be determined from the circuit-breaker or fuse protection of the circuit.

CURRENT RATING FOR INTERNAL WIRING

NOMINAL CROSS SECTION MM²	CONDUCTOR RATING				
	NUMBER OF CONDUCTORS IN BUNCH				
	1	2-3	4-5	6-9	10 AND MORE
2.5	28	25	22	19	16
4	37	33	30	26	22
6	47	42	38	33	28
10	64	54	51	44	38
25	112	101	89	78	67
35	138	124	110	96	88
50	172	154	137	120	103
70	213	191	170	149	127

The above table shall be applied for ambient temperatures up to 30 C. (Refer to table 41.2 in VDE 0100). For higher ambient temperatures the values shall be derated as prescribed by SABS 0142. Table 10.

4. Internal Wiring

- Standard 600/1 000 V grade PVC-insulated stranded annealed copper conductors to SABS 150 shall be employed for the internal power wiring of switchboards. The smallest conductor size to be used for power wiring in switchboards shall be 2.5mm². Flexible cord of minimum size 1,0mm² may be used for control wiring.

- Where heat generating equipment is present and the internal temperature of the board is likely to exceed 50°C, silicon-rubber insulated stranded conductors shall be used.

- Wiring shall be arranged in horizontal and vertical rows and shall be bound with suitable plastic straps or installed in PVC wiring channels. Under no circumstances may PVC adhesive tape be used for the bunching of conductors or for the colour identification of conductors.

- Bunched conductors shall be neatly formed to present a uniform appearance without twisting or crossing the conductors. Conductors leaving the harnesses shall be so arranged that they are adjacent to the chassis.

- Conductors to hinged panels and doors shall be secured on both the door and the frame and shall be looped between the two points. The loop shall be arranged to produce a twisting motion when the door is opened or closed. A flexible protection sleeve shall be installed over the conductors.

- Where wiring channels are used, they shall be installed horizontally and vertically. Under no circumstances may power and control circuit wiring be installed in the same wiring channels. Channel shall not be more than 40% full.

- All wiring between different Panels within the same switchboard shall be installed in wiring channels.

- Grommets shall be installed in each hole in the metal work through which conductors pass.

- All wiring shall be installed away from terminals, clamps or other current carrying parts. Wiring shall also be kept away from exposed metal edges orshall be protected where they cross metal edges.

- Protected where they cross metal edges.

- Conductors may be jointed at equipment terminals or numbered terminal strips only. No other connections are allowed.

- Where conductors change direction, smooth bends shall be formed with a radius of at least 5 times the outside diameter of the conductor or harness.

- Where screened cables are specified, the screening shall be earthed in the switchboard or control board only unless clearly specified to the contrary, Screened cables entering control boxes through pressed knock-outs, shall terminate in compression glands. Conductors shall as far as possible remain inside the screening at terminations. Where conductors have to separate from the screen, the braiding shall be separated and the conductors drawn through the braid without damaging the braiding. The conductors shall then be connected to their respective terminals and the screening smoothed and connected to the earth terminal.

- Where neutral connections are looped between the terminals of instruments, it is essential that the two conductor ends be inserted into a common lug or ferrule and are crimped or soldered together in order that the neutral connection is not broken when the conductors are removed from one of the instruments.

- Wiring should as far as possible be confined to the front portions of switchboards for ease of access. This requirement is important for wiring between smaller circuit-breakers and the associated main circuit-breaker as well as the wiring from circuit-breakers to lighting and socket-outlet circuits.

- A maximum of two conductors will be allowed per equipment terminal. Where more conductors must be connected to the same equipment terminal (e.g. a main circuit-breaker feeding other circuit-breakers), stub busbars shall be provided for the various conductors. Refer also to par. H.6.

5. Load End Connections

The supply end connections to all equipment shall under all circumstances be at the top and the load end connections at the bottom.

6. Wiring to Circuit-breakers

Equipment with a rating exceeding the current rating of 70mm² conductors shall be connected by means of busbars to the main busbars. Looped connections may only be installed for a maximum of two outgoing circuits. Where there are more than two outgoing circuits, busbars shall be used and equipment connected individually to the busbars. Where miniature circuit-breakers are mounted in continuous rows and supplied by busbars connected to each MCB. Each busbar shall be supplied by a separate conductor. This conductor shall be connected to the busbar by means of a separate lug and not via an MCB terminal.

7. Conductor Terminations

Conductors connected to terminals complying with the Municipalities standard specification for "WIRING TERMINALS". Section C9, need not be soldered or ferruled. Connections to circuit-breakers, isolators or contactors shall be made by one of the following methods:

- A ferrule of the correct size,

- soldering the end of the conductor, or

- Winding a conductor strand tightly around the end to totally cover the end.

All conductors terminating on meters, fuse holders and other equipment with screwed terminals shall be fitted with lugs. The lugs shall be soldered or crimped to the end of the conductor. The correct amount of insulation shall be stripped from the end to fit into the terminal. Strands may not be cut from the end of the conductor.

8. Identification

- The colour of the conductors for all 220/250 V circuits shall correspond to the colour of the supply phase for that circuit. Neutral conductors shall be black.

- All other conductors in the board, supplying control circuits, etc. shall be coded in colours other than those specified above. A colour code shall be devised for each board and the colour code shall be shown on the wiring diagrams.

- All conductors that terminate at wiring terminals and all conductors used for the internal wiring of the switchboard, shall further be identified at both ends by means of durable cable marking ferrules. PVC or other tape is not acceptable.

- The numbers on the markers shall be shown on the wiring diagrams.

i) PAINT FINISH

Metal components of the framework, panels and chassis shall be painted in accordance with the Municipalities "STANDARD PAINT SPECIFICATION". Metal components of the framework, panels and chassis shall be finished with a high quality paint applied according to the best available method. Baked enamel, electro-statically applied powder coating or similar proven methods may be used. Care shall be taken to ensure that all edges and corners are properly covered.

j) LABELLING

Care shall be taken to ensure that all equipment is fully labelled and that accurate descriptions and safety warning notices appear in both official languages.

1. Material

Engraved plastic or ivory sandwiched strips shall be used throughout. The strips shall bear white lettering on a black background for normal labels and red letters on a white or yellow background for danger notices.

2. Main Switchboards

Main switchboards and sub-main switchboards shall be supplied with the following bilingual labels:

3. Number and allocation of switchboard. Example:

Distribution Board : DB-CC1
Fault Rating : **Fed From :** **Feeder/Cable Size :**

Lettering: at least 10 mm high. Label on the outside in a prominent position.

4. Equipment identified

All equipment on switchboards shall be identified with the necessary labels. The circuit numbers shall appear at all grouped single pole circuit breakers. The abovementioned circuits shall be identified on a legend card, which shall be installed on the inside of the switchboard door, or in any other position where it can conveniently be observed. All fuses including instrument fuses shall have labels stating function, fuse rating and duty or type where applicable. All other equipment shall be identified separately and their functions shall be clearly indicated.

Where cascading of circuit breakers occur in a distribution board, a suitable label of notification must be provided.

5. Testing

The Engineer shall be notified when the mechanical construction of the switchboard i.e. frame, panels and base frame, is completed in order that he or his representative may inspect it at the factory.

Function tests of all equipment, control and interlocking circuits shall be conducted to the satisfaction of the Engineer. The proper functioning of all protection relays and ammeters shall be proved by means of current injection on the primary side of the relevant current transformers.

Testing equipment and facilities including instruments, dummy loads and additional switchgear and cables, at the factory or on site, shall be provided by the Domestic Sub-Contractor at no extra cost. The Engineer shall be notified in writing two weeks in advance of any tests to be conducted, to allow him or his representative to be present at such tests. A complete report on the tests shall be handed to the Engineer.

6. Drawings & Manuals

(a) Drawings for approval

A set of prints of the shop drawings for the switchboards shall be submitted to the Engineer for approval before the boards are manufactured. The following information shall be present:

- A complete wiring diagram of the equipment on the boards.
- A complete layout of the arrangement of the switchboards indicating all equipment dimensions and the construction of the boards. The positions and method of fixing of busbars shall be shown.
- All labelling information on a separate sheet.
- The make, catalogue number and capacity of all equipment such as isolators, circuit breakers, fuses, contactors, etc.

The approval of drawings shall not relieve the Sub-Contractor of his responsibility to the Owner to supply the switchboards according to the requirements of this Specification.

(b) Final Drawings

A complete set of "as-built" transparent drawings of all switchboards shall be submitted to the Engineer immediately after completion of the installation and shall be included in the handover files.

(c) Manuals

Three sets of manuals for all switchboards shall be forwarded to the Engineer at no extra cost and to be included in the handover files. These manuals shall include the following information:

- Complete information on the operation of the equipment,
- Complete information for maintenance of the equipment,
- Brochures and ordering information, and
- Complete material list indicating quantities and relevant catalogue numbers.

2 SWITCHGEAR

a) GENERAL

Switchgear, which includes circuit breakers, iron-clad switches, interlocked switch-socket outlet units, contactors, time switches, etc., is to be in accordance with the Municipalityal Quality Specifications which form part of this specification and shall be equal and similar in quality to such brands as may be specified.

For uniform appearance of switchboards, only one approved make of each of the different classes of switchgear shall be used throughout the installations.

Circuit breakers shall be of the size and type as directed and specified for the service. They shall comply with SABS Specification 156 and SABS IEC 60947-2.

Switchgear manufactured in South Africa shall be given first preference and far as possible be used. Switchgear where applicable shall bear the SABS mark and comply with the requirements of the appropriate B.S. or I.E.C. specification and applicable standards below.

Imported materials shall comply with the requirements of the appropriate B.S. or I.E.C. specification and applicable standards below.

Circuit breakers and all switchgear shall be approved by the Municipalities Representative. Boards with fault level ratings less than 10 kA shall comply with SANS 1765 and fault levels equal to or greater than 10 kA with SANS 60439-1. Surge arresters for use in distribution boards shall comply with SANS IEC 61643-1.

b) APPLICABLE STANDARDS

Number	Title	Use
IEC/EN – 60947 - 2	Low-voltage switchgear and controlgear – Part 2: Circuit-breakers	Applies to circuit-breakers, the main contacts of which are intended to be connected to circuits, the rated voltage of which does not exceed 1 000 V a.c. or 1 500 V d.c.
IEC/EN 60364	Low-voltage electrical installations	
IEC/EN 61643-1	Low-voltage surge protective devices	This part of IEC 61643 is applicable to devices for surge protection against indirect and direct effects of lightning or other transient overvoltages.
IEC/EN – 61643-11	Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods	
IEC/EN – 60 898	Circuit breakers for over current protection for household and similar installations.	Double standard conformity
IEC/EN – 61008-1	Residual current operated circuit-breakers without integral over current protection for household and similar uses	
IEC/EN 60479-1	Effects of current on human beings and livestock Part 1: General aspects	
IEC/EN 61000-4-5	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test Reference	
IEC/EN 60755	General requirements for residual current operated protective devices	
IEC/EN 61009-1	Residual current operated circuit-breakers with integral over current protection for household and similar uses (RCBOs).	

c) PROTECTIVE DEVICES CHARACTERISTICS

The breaking devices must be capable of heavy-duty operation and to that end; the manufacturer shall guarantee the following performance levels:

- Suitability for isolation
- Positive contact indication through a green strip indicator operating independently to the toggle position
- Rated insulation voltage: 500 V (visisafe)
- Pollution degree: 3
- Rated impulse-withstand voltage: 6 kV (visisafe)

They will also provide, on their front face, an integrated indication of welding contacts.

To ensure the longest possible service life, switching mechanisms shall be designed to make the contact-closing speed totally independent of the operator's action. (Fast closing)

Contact positions, for breakers and residual current devices, shall be clearly indicated on the front of devices and marked:

- "I - ON", standing for device contacts closed, circuit energised,
- "O - OFF" with a green background, standing for device contacts open, circuit disconnected.

The breakers and residual current devices shall all provide a dedicated and integrated indication, enabling to identify a fault-driven tripping. (Visitrip)

For safety insurance, accessible parts of the devices, when installed in a suitable enclosure, shall feature:

- degree of protection IP40
- Insulation class II.

d) BREAKERS GENERAL CHARACTERISTICS AND OPERATION

Circuit breakers characteristics:

Circuit breakers shall comply with international standards IEC/EN 60898 and IEC/EN 60947-2

Compliance with these standards shall be certified by an independent organisation and its quality mark shall be visible on the devices.

Circuit Breakers Operation:

Circuit breakers shall be capable of operation under ambient temperature up to 50 °C, without de-rating of their overload tripping threshold with respect to their rated operating current.

Where the line supplying the switchboard is protected by a circuit breaker rated 125 Amps or more, the protection provided by this one shall be totally selective with respect to circuit breakers located in the switchboard (up to 63 A, type B or C).

e) RESIDUAL CURRENT DEVICES GENERAL CHARACTERISTICS

RCCB general characteristics:

RCCBs shall comply with international standard IEC/EN 61008.

Compliance with the standard shall be certified by an independent organization and its quality mark shall be visible on the devices.

The rated making and breaking capacities shall be at least equal to 1.5 kA both for fault currents between live conductors (Im) and for earth-fault currents (IΔm).

The rated conditional short-circuit currents (Inc and IΔc) shall be greater than or equal to the prospective short-circuit current at the point of installation (Isc as per IEC 60364). The manufacturer shall guarantee these values do not differ from the rated breaking capacity of the circuit breaker providing short-circuit protection of the RCCB.

RCBO general characteristics:

RCBOs shall comply with international standard IEC/EN 61009.

Compliance with the standard shall be certified by an independent organisation and its quality mark shall be visible on the devices.

The RCBOs shall provide 2 integrated fault indications: one to indicate a tripping due to overload or short circuit and one to indicate a tripping due to residual current.

RCD with reinforced immunity:

RCDs located upstream of the following loads shall have a reinforced immunity to restrict power outages to the strict minimum required for user safety:

- Sets of fluorescent lighting, halogen lighting supplied with LV or ELV power,

- Groups of PCs and work stations,

- Motors driven by single-phase variable-speed drives…

The reinforcement in performance means that the RCDs shall not trip in the following situations:

- Continuous 1 kHz leakage current, 8 times higher than the rated tripping threshold

- Leakage currents and transient over voltages due to lightning strikes, switching, decoupling capacitance discharges, etc.:

- 5 kV peak voltage for a 1.2/50 µs wave (IEC/EN 61000-4-5),
- 3 kÂ leakage current for an 8/20 µs wave (IEC/EN 61008),
- 400 Â leakage current for a damped sinusoidal 0.5 µs / 100 kHz ring wave (IEC/EN 61008),
- residual current equal to 5 times the rated residual operating current for a duration less than or equal to 10 ms,
- Very high-frequency inducted or conducted disturbances (starting at 150 kHz).
  The RCDs must trip for fault currents with a DC component (type A as per IEC 60755).

  The same is required for residual current devices located downstream of UPSs.

f) SURGE ARRESTERS CHARACTERISTICS AND OPERATION

Protection of loads against destruction by lightning shall be implemented in final distribution switchboards: each load shall be protected by a surge arrester

Therefore, final distribution switchboard shall embed a surge arrester compliant with IEC 61643-1 / EN 61643-11 standard. Compliance shall be proved by a quality label printed on the device.

Type 1 SPD (Class 1)

When a Type 1 is required the value of Iimp shall not be less than 50kA for each mode of protection [IEC60364-5-534].

Type 2 SPD (Class 2)

When a Type 2 is required, the nominal discharge current In shall not be less than 20kA for each mode of protection [IEC 60364-5-534]

Note: Where Class 1 & Class 2 combination is used, Class 1 shall be 50kA/(10/350µs) and Class 2 shall be 50kA/(8/20µs)

Type 3 SPD

An additional SPD is required when the length between the Type 2 and the sensitive electrical equipment is higher than 10 meters. The Open circuit Voltage Uoc value preferred is 10kV

Surge arresters operation

Its operating voltage Uc will not be less than 340 V between live and earth as well as phase to neutral.

It will be made of withdrawable cartridges, with rated maximum discharge capacity 8 kA.

The surge arrester will be set so as to ensure the distance between its earth terminal and the incoming earth terminal block not to be more than 15 cm.

Surge protection out of order (missing cartridge, replacement required) will be:

- Notified by an indicator on front
- Reported to Supervision centre by means of an indication switch.

According to IEC 61643-1 / EN 61643-11, the surge arrester shall be associated with a dedicated disconnector, the opening of which will not disturb or turn off power supply to any downstream located load. This disconnector will be made of a circuit-breaker, compliant with IEC / EN 60 898 standard. Disconnecting circuit-breaker shall be integrated with the surge arrester: in case of trip, it will be possible to reset it only once all required cartridges have been replaced.

g) PROTECTIVE DEVICES MAINTENANCE

RCDs shall be tested every 6 months using the test button. When conditions are extreme (saline environment, chlorine, high level of dust), it is recommended that testing be done every 3 months.

h) SUSTAINABLE DEVELOPMENT

Production site organisation shall comply with the requirements of the ISO 9002 and ISO 14001 standards.

For the devices, the manufacturer should be able to provide following arguments:

- Hazardous substances content (RoHS conformity declaration & REACH assessment referring to last update of SVHC candidate list).
- Environmental impacts characterized by several indicators (through Life Cycle Analysis & Product Environmental Profile) with at least:
- Raw material depletion
- Energy depletion
- Global warming / carbon footprint
- Water depletion
- Recyclability information (Product Environmental Profile / End of Life Instruction).
  The devices shall be delivered in packaging compliant with European Directive 2004/12/CE

3. LABELLING

3.1 All equipment shall be fully labelled and accurate descriptions shall be given in both official languages.

3.2 Engraved brass shall be used for labels. The labels shall be riveted to the kiosks.

3.3 The following labels shall be supplied as a minimum requirement:

3.3.1 Number and allocation of kiosk, e.g. KIOSK B26
(Lettering: At least 10mm high. Label on the outside in a prominent position).

3.3.2 Designation of circuit i.e. circuit-breaker, isolator, meter, etc. e.g.

HOUSE 473
HUIS473
PUMP SUPPLY
POMPTOEVOER
(Lettering: At least 5mm high. One label installed directly below each item of equipment pertaining to the particular circuit shall be provided).

3.3.3 The main switch shall be marked in accordance with the regulations.

3.3.4 The function and circuits of all other equipment shall be clearly identified. Flush mounted equipment within the front panel shall be identified by labels fixed to the front panel. The labels for all equipment installed behind panels shall be fixed to the support panel close to the equipment.

3.3.5 The labels shall be secured by means of rivets. Self-tapping screws are not acceptable. Labels shall not be glued to their mounting positions. Sufficient rivets shall be provided to prevent labels from warping.

3.3.6 All label designations shall be confirmed with the Municipality before manufactured.

4. NOTICES

At least one with the words "DANGER/INGOZI/GEVAAR" shall be mounted outside on the front of the kiosk. This notice shall be riveted to the steel or cast iron door so that it cannot easily be removed. Brass rivets shall be used. The notice shall be laminated into the fibreglass door in the case of fibreglass kiosks.

5. INSPECTION

The Municipality shall be notified at least two weeks in advance of the completion of the kiosks in order that an inspection may be carried out before delivery.

6. DRAWINGS

6.1 Drawings for Approval

6.1.1 A set of three prints of the shop drawings of the cubicles shall be submitted to the Municipality for approval before the cubicles are manufactured. The following information shall be presented:

(a) Schematic and wiring diagrams of the cubicles.

(b) A complete layout of the arrangement of the cubicles showing all equipment dimensions and constructional details. The positions and method of fixing of busbars shall be shown.

(c) All labelling information in both the official languages on a separate sheet.

(d) The makes, catalogue numbers and capacities of all equipment.

(e) A detail drawing of the concrete plinth, showing concrete mixes, dimensions, sizes, steel reinforcing details and holding-down bolt fixing details.

6.1.2 The approval of drawing shall not relieve the Contractor of his responsibility to the Municipality to supply the cubicles according to the requirements of this Specification.

6.2 Final Drawings

A complete set of "as built" drawings of the cubicles shall be submitted to the Municipality within two weeks after delivery of the kiosks. The information contained in par. 17.1.1 shall be provided.

6.3 Completion

The supply contract shall be regarded as incomplete until all drawings have been handed to the Municipality.

7 LUMINAIRES

LED LIGHTS

All Light fittings installed for this project is to be of the LED type, unless otherwise stated.

The following international standard specifications and South-African Bureau of Standards shall apply to the LED luminaire specification:

SANS 475	Luminaires for interior lighting, street lighting and floodlighting – Performance and requirements
SANS 10114-1	Interior lighting part 1: Artificial lighting of interiors
SANS 10114-2	Interior lighting part 2: Emergency lighting
SANS 60598-1	Luminaires part 1: General requirements and tests
SANS 60598-2.1	Luminaires part 2: Particular requirements section 1 – Fixed general purpose luminaires.
SANS 60598-2.2	Luminaires part 2: Particular requirements section 2 – Recessed luminaires.
SANS 60598-2.3	Luminaires part 2: Particular requirements section 3 – Luminaires for road and street lighting.
SANS 60598-2.5	Luminaires part 2: Particular requirements section 5 – Flood lighting.
SANS 61347-1 to 13	Lamp control gear
SANS 62031	LED modules for general lighting – Safety specifications
SANS 62384	DC or AC supplied electronic control gear for LED modules – Performance requirements.
SANS 62560	Self-ballasted LED lamps for general lighting services with supply voltages > 50V – Safety specification.
SANS 62612	Self-ballasted LED lamps for general lighting services with supply voltages > 50V – Performance requirements
EN 55015	Limits and methods of measurement of radio disturbance of electrical lighting or equipment.
EN 61000-3.2	Electromagnetic compatibility (EMC) limits for harmonic current emissions.
EN 61000-3.3	Electromagnetic compatibility (EMC) limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.
EN 61547	Equipment for general lighting purposes: EMC immunity requirements.
IEC-EN 62471	Photo biological safety of lamps and lamp systems for LEDs
IES LM-79-08	Approved method: Electrical and photometric measurement of solid-state lighting products.
IES LM-80	Approved method: Measuring lumen maintenance of LED light sources.

General requirements:

The luminaire shall be suitable for operation with mid-power LEDs. **Note that no LED tubes are allowed to be used.**

The luminaire shall be suitable for operation on a 230V single phase 50Hz mains supply.

Power factor capacitors shall be supplied to correct the power factor to at least 0.95 of higher.

The luminaire shall be marked with identification labels stating the brand name and model and shall bear the SANS approval mark.

The driver shall comply with IEC 61347-1 and IEC 61347-2B as applicable and shall be suitable for operation on 230V +- 10%, 50Hz single phase system and it must be insured that harmonics filter is provided as per SANS 61000-3-2. The drivers and LED circuitry shall be protected against lighting and power surges. Suitable surge arrestors with a 10kA rating shall be provided for indoor installations and 20kA for outdoor installations.

Colour rendering (Ra) shall be not less than 80 and lumen depreciation of not more than 30% L70 at 50 000 hours @ T 25°C. Colour temperature of the LED lamp shall be 4000K, unless otherwise stated.

Thermal requirements:

The luminaire must be able to withstand an ambient temperature of 35°C. Storage temperature of this luminaire should be able to handle -40°C < T < 60°C.

To this end internal electrical and mechanical components shall not be allowed to exceed their maximum temperature ratings of 75°C. Test reports from an independent authorised testing facility proving this requirement shall be made available on request.

Noise requirements:

The noise level emitted from the luminaire shall be kept as low as possible. Drivers/electronic components shall therefore fully comply with the latest edition of SANS 55015.

8 STANDARD PAINT SPECIFICATION

1. FINISH REQUIRED

Metalwork of electrical equipment such as switchboards, equipment enclosures, sheet steel luminaire components, purpose-made boxes, etc. shall be finished with a high quality paint applied according to the best available method. Baked enamel, electrostatically applied powder coating or similar proven methods shall be used.

2. CORROSION RESISTANCE

Painted metal shall be corrosion resistant for a period of at least 168 hours when tested in accordance with SANS 166.

3. EDGES

Care shall be taken to ensure that all edges and comers are properly covered.

4. SURFACE PREPARATION

Surface preparation shall comply with SANS 10064. Prior to painting, all metal parts shall be thoroughly cleaned of rust. mill scale, grease and foreign matter to a continuous metallic finish. Sand or shot blasting or acid pickling and washing shall be employed for this purpose.

5. BAKED ENAMEL FINISH

5.1 Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough unbroken metal-phosphate film and then thoroughly dried.

5.2 Within forty eight (48) hours after phosphatising, a passivating layer consisting of a high quality zinc chromate primer shall be applied, followed by two coats of high quality alkyd-based baked enamel.

5.3 The enamel finish on metal luminaire components shall comply with SANS 783, Type III.

5.4 Other metal parts e.g. switchboard panels, etc., shall comply with SANS 783, Type IV with a minimum paint thickness after painting of 0,06mm. In coastal areas, the dry film thickness shall be increased to at least 0,1mm.

5.5 The paint shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg

6. POWDER COATED FINISH (NOT TO BE USED LESS THAN 50KM FROM SEASIDE)

Immediately after cleaning the metal parts shall be pre-heated and then covered by a microstructure paint powder applied electrostatically. The paint shall be baked on and shall harden within 10 minutes at a temperature of 190°C.

The minimum paint thickness after baking shall be 0,05mm. The dry film thickness shall be increased in coastal areas. The paint cover shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg.

7. TOUCH-UP PAINT

In the case of switchboards and larger equipment enclosures, a tin of matching touch-up paint not smaller than 1 litre shall be provided

PART 4: ELECTRICAL WORK MATERIAL SCHEDULE

The Contractor shall complete the following schedule.

The schedule will be scrutinised by the Electrical Engineer and should any material offered not comply with the requirements contained in the specification, the Contractor will be required to supply material in accordance with the contract at no additional cost.

NB: Only one manufacturer's name to be inserted for each item.

Item	Material	Make or trade name	
1.	Distribution boards		
2.	Circuit breakers 1P, 2P, 3P		
3.	On load isolators without trips		
4.	Contactors 1P, 2P, 3P		
5.	Earth leakage relays 1 & 3 phase		
6.	Fuses		
7.	Kilowatt hour meter		
8.	Current transformers	**N/A**	
9.	Voltmeter		
10.	Maximum demand ammeter		
11.	Daylight sensitive switch		
12.	Surge Arresters		
13.	Conduit		
14.	Conduit boxes		
15.	Surface switches		

16.	16A flush socket outlets		
17.	Fluorescent luminaires		
18.	Type S1		
19.	Type B1		
20.	Type B2		
21.	VERI DEPTH HANDLE		
22.	AUXILLARY		
23.	CONTACTORS 230VAC COIL		
24.	230VAC COIL		
25.	MECHANICAL INTERLOCK		
26.	AUXILLARY CONTACT BLOCK		
27.	PILOT LIGHTS 230VAC		
28.	PUSHBUTTON		
29.	3 POSITION SELECTOR SWITCH		
30.	6A SPCB		
31.	THERMISTOR RELAY +BASE		
32.	STAR DELTA TIMER 230VAC		
33.	4 POLE RELAY + BASE		
34.	RUN HOUR METER 230VAC		
35.	300/5A CT		
36.	300/5A AMMETER		
37.	0.5 - 5A MOTOR PROTECTION RELAY		
38.	32A FUSE HOLDER + FUSES		
39.	300/5A PROTECTION CTs		
40.	ULTRASONIC LEVEL CONTROLLER - 6 RELAYS		

41.	4 - 20mA PROCESS DISPLAYS		
42.	PILOT LIGHTS 230VAC		
43.	6A SPCB		
44.	4 POLE RELAY + BASE		
45.	32A FUSE HOLDER + FUSES		

PART 5: GENERATOR INSTALLATION

CONTENTS

1. DETAILED SPECIFICATION

This specification shall be read in conjunction with the relevant drawings, Bills of Quantities and General/Standard specification for this installation.

1.1. Scope of Works

The contract comprises the design, manufacture, assembly, delivery to site, off-loading at site, installation, testing, commissioning and handing over in first class working order of a complete Canopy type standby diesel generating set and all ancillary equipment necessary to comply with the requirements of this specification. The plant generally shall comprise a diesel engine coupled to an alternator mounted on a common base, a set of starting batteries, automatic charging unit, interconnecting cables, a control panel housing the generator M.C.C.B. and all necessary switchgear, exhaust, louvres, including the changeover equipment and on-load bypass switch, together with a fuel system, capable of running the set for 24 hours at full load. The set and bulk tank (base tank 1000 litres) shall be positioned on a bunded slab and this construction work forms part of this project. All generator alarms to be visual and audible.

1.2. Canopy & Plant Location

The set shall be a canopy (outdoor) type unit. The weather proof canopy shall be manufactured from 3CR12. It shall fit onto the sets base frame, making the entire unit self-contained. Lockable hinged doors (container type system with a robust locking facility required) shall allow access for maintenance purposes and louvres complete with vermin proofing shall be installed at both ends. The louvres shall be sized to suit the sets cooling and combustion air flow requirements. The canopy shall be painted with an etching primer, then finished with two coats of enamel paint.

The bunded slabs for both the generator set and bulk tank (where applicable and if required) forms part of this contract and drawings shall be provided to the engineer for approval, prior to construction taking place.

Tenderers are advised to acquaint themselves with the site conditions including access, as no claim on the grounds of want of knowledge will be entertained.

1.3. Plant Duties

The diesel generating set and its ancillary equipment shall normally operate as an automatic mains failure unit. It shall be capable of delivering its full rated output at any time and any ambient conditions likely to occur at the site. The generating set will not be required to be synchronized with the main supply.

1.4. System

The system to which the plant is to be connected is 3 phase, 4 wire, 400 volts between phases and 230 volt between phase and neutral, with a frequency of 50 Hz.

1.5. Rating

Note: The unit shall be capable of delivering 800 kVA full load at 0.8 power factor at Prime Power.

Load capacity shall not exceed 80% of full load at 80% power factor.

The unit shall deliver 60% initial load + - 15 sec after start up and the balance of load 40% shall be delivered after a further 10 sec.

The rating of the diesel generating set shall be based on operation of the set when equipped with all necessary accessories such as radiator fan, air cleaners, lubricating oil pump, fuel transfer pump, fuel injection pump, water circulating pump, and battery charging alternator.

The generator set shall be capable of delivering the specified output continuously under the site conditions without overheating. The engine shall be capable of delivering an output of 110% of the specified output for one hour in any period of 12 hours consecutive running in accordance with BS5514.

1.6. Diesel Engine

1.6.1. Type

The engine shall be of the multi cylinder, four stroke cycle, cold starting, direct injection, compression ignition type, suitable for operation on diesel fuel.

Only genuine engines with full local Original Equipment Manufacturer (O.E.M.) backup will be accepted. Grey products and "copies" will under no circumstances be accepted and will lead to the tender being rejected.

1.6.2. Cooling System

The engine shall be of the water cooled type and the cooling system shall be of sufficient capacity to cool the engine when the set is delivering its full rated load in the ambient conditions specified in Clause 1.

The engine shall be equipped with a heavy duty type radiator, complete with engine driven fan and centrifugal water circulating pump and a thermostat to maintain the engine at the makers recommended temperature level.

A thermostatically controlled immersion heater shall be provided and fitted in the engine cool-ing circuit to ensure easy starting of the engine at any ambient temperature.

The heater shall be so fitted that it can easily be withdrawn without having to drain the system. The heater shall be suitable for a 220 volt 50 Hz supply.

A low radiator level shutdown sensor switch shall be fitted in the radiator header tank. A separate temperature sensor must be fitted on the block for the normal high engine temperature shutdown and gauge.

The sight gauge shall be easily accessible for reading purposes and it shall be safe and easy to top up the coolant without having to climb inside or over the unit.

1.6.3. Speed
The engine speed shall not exceed 1500 R.P.M. at normal full load conditions.

1.6.4. Fuel
The engine shall be capable of satisfactory performance on a commercial grade of distilled petroleum fuel oil such as Number 2 fuel oil. (Commercial grade diesel fuel: 500ppm).

1.6.5. Rating
The engine shall be suitable for continuous running at the specified speed, delivering its rated output at the specified site conditions.

In addition the engine shall be capable of delivering 110 % load for one hour, after the set has been running at full load for a period of six hours and shall, after the overload period of one hour be capable of maintaining the rated output continuously without any undue mechanical strain, overheating, incomplete fuel combustion or other ill effects.

The engine shall have sufficient capacity to start up and shall within 15 seconds from mains failure, supply the full rated load at the specified voltages and frequency.

1.6.6. Governor

The engine shall be of the latest electronic type, or controlled by a governor to maintain governed speed for 50 Hz operation. Class A1 governing in accordance with B.S. 5514 as amended is required.

1.6.7. Fuel System
The complete system including base tank shall be sized to allow the set to run for 24 hours at full load.

An engraved label shall be installed in a conspicuous area on the generator control panel that indicates the following:

- Base tank capacity.
- Bulk tank capacity.
- Full load litres per hour consumption.

1.6.8. Base Tank
The base tank shall be a closed channel self-bund walled type that shall be of sufficient capacity to contain any spillage, equivalent to 80% in volume of the base tank. A float level alarm connected to the generator controller

shall be incorporated into the bund area located such that the alarm will be activated when 50% of the volume of the bund area has been reached in the event of any diesel fuel leakage.

The base tank shall be fitted with a suitable filter, breather pipe, visual gauge, removable inspection cover, drain, filler cap, low level and extra low shutdown alarm sensors. These shall supply an audible and visible signal on the control panel.

In addition, pump / solenoid valve start / stop sensors are required to control the automatic filling of the base tank from a remote free standing tank.

The set shall also be supplied with a hand operated "wing pump" and a suitable length of oil resistant hose, suitable for filling it from containers. The hose shall be of the "push lock" type and shall be sufficient in length to extend 5 meters outside of the canopy door.

The fuel tank shall be an integral part of the base frame of the generator set. The tank shall have sufficient capacity to run the engine on full load for a minimum period of 24 hours.

1.6.9. Bulk Tank (if the base tank cannot meet the required volume)

The bulk fuel tank shall consist of an ISO 9001 quality containerised double walled tank mounted on a steel reinforced concrete plinth of suitable MPa strength to carry the weight of a fully fuelled bulk tank and canopy type generator. The size and configuration of the bulk tank shall be matched to the size of generator to enable the generator to run continuously for a minimum period of 60 hours on full load.

In the event of the standard bulk tank size being in between the required volume, the next largest size must be supplied

The composite bulk tank together with all interconnecting supply and return pipes, low level alarm, visual fuel level indicators, lockable shut off valves, breather and an automatic filling system shall be provided. The bulk tank shall be located adjacent to the outdoor generator.

The automatic filling of the base tank, from the bulk tank, shall be controlled by level switches mounted in the base tank. These switches shall start and stop the electric self-priming pump, or solenoid valve system.

Manually operated filling of the base tank from the bulk tank shall be by way of a spring loaded push button switch that shall switch off the pump if the push button switch is released by the operator.

Drain plugs shall be constructed in such a manner that shall prevent the removal of such drain plug by conventional means i.e. shifting spanner, pliers etc.

The construction of the reinforced concrete plinth and other minor civil work shall form part of this contract.

1.6.10. Lubricating

The engine shall be provided with a forced feed lubricating system with a gear type lubricated oil pump for supplying oil under pressure to the main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, valve rocker mechanism and all other moving parts.

Full flow replaceable element type oil filters, conveniently located for servicing, shall be provided. Filters shall be provided with a spring loaded by-pass valve to ensure circulation if the filters become clogged.

1.6.11. Cylinder lining

The engine shall be provided with removable wet or dry type cylinder liners of close grained alloy iron.

1.6.12. Air Cleaners

The engine shall be provided with one or more dry type air cleaners which shall provide positive air filtration.

1.6.13. Exhaust System

The engine shall be fitted with an efficient 3CR12 exhaust system for inland areas. Flexible bellows shall be fitted between the exhaust outlet and the silencer. The flexible piping must on no account be used to form a bend or compensate for misalignment. The silencer shall be located within, or on top of the canopy. The silencer shall be of the highly efficient type suitable for use in residential areas and shall be capable of providing 20 to 30 decibels of suppression.

The silencer and discharge piping shall be suitably supported.

The exhaust pipe inside the canopy shall be suitably lagged then clad in galvanized or polished stainless steel sheet.

The end of the exhaust shall be cut to a 45-degree angle, in order to prevent rain ingress and mesh shall be welded into the end to prevent birds or rodents from entering the pipe.

1.6.14. Flywheel

The flywheel shall be designed to limit the cyclic irregularities to within the limits laid down in B.S. 5514 as amended.

1.6.15. Engine Starting

The engine shall be equipped with a 12/24 volt starting system of sufficient capacity to crank the engine at a speed, which will allow starting of the engine.

The starting equipment shall include a 12/24 volt D.C. starter motor engaging directly on the flywheel ring gear. A heavy duty battery charging alternator and maintenance free batteries of the Delco/Deltec type shall be supplied. The batteries shall be mounted in a lockable battery box.

The batteries shall be connected to the engine with suitably rated P.V.C. insulated flexible leads.

The batteries shall have sufficient capacity to provide three automatic attempts to start immediately followed by three manual attempts without any appreciable drop in voltage. The automatic attempts to start shall each be of not less than 10 seconds duration with 10 second intervals between and the manual attempts shall be based on the same cranking period.

A device shall be provided to limit the cranking time of each automatic attempt to start, to the 10 seconds specified above and to provide three automatic attempts after which the automatic starting mechanism will cut out until manually reset and at the same time sound an audible alarm and illuminate the L.E.D. on the AMF controller. The engine driven battery charging alternator shall have sufficient capacity to recharge the batteries back to normal starting requirements in not more than six hours.

A battery charging unit of the trickle charge type shall be provided to maintain the batteries at full capacity when the set is at rest. The charging equipment shall be connected so that the battery is normally charged from the mains, but is also charged under mains failure conditions from the diesel generating plant and if required via an inhibitor relay to prevent dual charging.

The unit shall be complete with voltmeter, push button test, D.C. and A.C. protective gear.

The charging unit shall be incorporated in the diesel generator control cabinet.

1.6.16. Engine Instruments

As per the Deep Sea 7320 Controller.

1.6.17. Safety Controls

The engine shall be equipped with the safety controls as specified in 11.4.

1.6.18. Engine/Alternator Coupling and Base

The engine and alternator shall be direct coupled and arranged for operation at 400/230 volt, 50Hz and 1500 RPM.

A steel fabricated base-frame (incorporating the day fuel tank) with anti-vibration mounts between the engine / alternator combination and base shall be provided and must be able to be placed directly on the concrete plinth / slab.

The base frame shall incorporate the canopy mounting arrangement.

1.7. Radiator Extract Ducting

A galvanized duct shall be provided and installed between the radiator face and outlet louver to positively duct the hot expelled air out of the canopy. A flexible section shall be fitted between the radiator face and duct in order to prevent the recirculation of hot discharged air.

1.8. A.C. Generator

As per the engine requirements, only genuine and locally supported recognised Original Equipment Manufacturers (O.E.M.) alternators will be acceptable. Grey products and copies are unacceptable and will result in the Tender being rejected.

1.8.1. Rating

The generator shall be a 400/230 volt, 3 phase, and 4 wire 50 Hz machine. The generator rating shall be applicable for continuous service application.
Note: The unit shall be capable of delivering 200 kVA at 0.8 power factor at Prime Power.

The unit shall deliver 60% initial load + - 15 sec after start up and the balance of load 40% shall be delivered after a further 10 sec.

1.8.2. Construction and Manufacture
The generator shall be a revolving field type, coupled directly to the engine flywheel through a flexible disc for positive alignment. The generator housing shall bolt directly to the engine flywheel housing and shall be equipped with a heavy duty ball bearing support for the rotor. The motor shall be dynamically balanced up to 25 % over speed.

The generator shall be of heavy duty compact design. Insulation shall be Class H as recognised by B.S.5514.

The generator field excitation shall be performed by a rotating exciter mounted on the generator motor shaft through a brushless rotating diode system. The voltage regulator shall be of the static-magnetic type with silicon diode control. It shall be mounted on the top or side of the generator and enclosed in a drip proof enclosure. A built in voltage adjusting rheostat shall provide 10 % voltage adjustment.

1.8.3. Performance
The generator shall be capable of continuously delivering the full rated load specified in Clause 9.1 and of providing a 10 % overload for the period and in the manner specified for the engine in Clause 7.5.

1.8.4. Wave Form
The shape for the voltage and current wave shall be within the limits laid down by B.S. 5000.

1.8.5. Voltage Regulation and Response

The alternator shall be self-regulated and shall incorporate an automatic voltage regulator.

The voltage regulation shall not exceed ± 2½%, from no load to full load, including cold to hot variations at any power factor between 0.8 lagging and unity and inclusive of speed variations within the limits stated in Clause 7.6.

Upon application of full load at a power factor of 0,8 lagging the alternator voltage shall recover to within 2½% of the steady state value within approximately 300 milliseconds.

Upon application of any load specified in transient, maximum voltage dip shall not exceed 20% of the nominal voltage when measured at the alternator terminals.

1.8.6. Windings

The generator stator windings shall be star connected with the star point brought out and connected to the neutral terminal in the terminal box on the generator to provide a 400/230 volt supply.

1.8.7. Terminal Box

The terminal box shall be fitted to suit the cable route and it shall be large enough to allow for glanding and connecting the cables specified in Clause 12.2.

1.8.8. Radio and T.V. Interference

The generating set shall be suitably suppressed within the limits of B.S. 800 against radio and television interference.

1.9. Diesel Generator Control Panel

1.9.1. Type and Construction

The control panel shall be designed for the control of the diesel generating set with instrumentation and protective devices to meet both manual and automatic mode requirements.

The control panel shall be of robust construction, totally enclosed and dustproof.

It shall be of folded 1,6 mm thick cold rolled sheet steel construction, suitable for front entry through hinged doors. Internal chassis plates, circuit breaker pans and gland plates shall be provided. Special attention shall be given to vermin proofing and dust sealing.

Prior to painting, all steelwork must be thoroughly degreased and re-rusted and then primed with a zinc chromate primer. All internal steel chassis plates, gland plates and switchgear brackets shall be painted with white powder epoxy paint and all exterior steel surfaces shall be finished with red powder epoxy paint.

The control panel shall be built into three separate sections, with the controls, change-over and on load bypass switch each having its own section.

1.9.2. Bus-Bars, Wiring, Switchgear, etc.

All bus-bars and wiring shall be adequately rated and suitably supported, and control wiring shall be neatly laced and numbered with durable plastic ferrules, for easy tracing. Suitable terminals are to be provided for incoming and outgoing cables. Suitably sized holes shall be punched in the gland plates for the required number of cable terminations for both incoming and outgoing cables. The cables shall be secured to the gland plate by means of cable glands as Pratley, C.C.G. or other approved. The gland plate shall be suitably braced to prevent distortion after the cables are glanded thereto.

Circuit breakers are to be of moulded case construction and the 4 pole motorized change-over switch and “On Load” bypass switch shall be a reputable make, with full local representation.

All instrumentation shall be of 1.5% accuracy and their performance shall comply with B.S.89. The instruments shall be flush mounted and the dial dimensions shall be 96mm x 96mm.

Tenderers must give assurance with their tender that replacements for the equipment, switchgear and instruments used in the construction of the panel are readily available from stock held in the Republic of South Africa.

1.10. Control Panel

1.10.1. The change-over panel is to be situated inside the canopy.

1.10.2. The supply and installation of all cables and supports between the generator set and AMF control panel forms part of this contract.

1.10.3. Changeover Board and Bypass Switch:

- 1 x 3.P. Generator MCB. The MCB shall be rated to suit the generator offered and shall have both adjustable thermal and instantaneous overload elements.

- 1 x Set of FOUR Pole automatic changeover isolators with motor operated mechanisms (Minimum rating of 1250amps) and with appropriate auxiliary and control contacts with electrical and mechanical interlocking arrangements to the approval of the Department. The units are to be Socomec, ABB or other approved prior to the close of the Tender.

- 1 x On load hand operated by pass switch (Minimum rating of 1250amps Adjustable) of the isolator type with three operating positions labelled "NORMAL", "OFF" and "BYPASS” to enable the changeover equipment and control circuitry to be by passed for maintenance purposes. The units are to be Socomec, ABB or other approved prior to the close of the Tender.

- By-pass switch required.
- 3 x Open ring CT's suitably scaled.
- 1 x Open ring VT
- Load, neutral and earth bus-bars.

1.10.4. Control Section

- Automatic constant voltage battery charger.
- Electronic governor control (if required and not an electronic engine).
- Control C/B for instruments.
- Control relays for change over contacts.
- 12 / 24 Volt fuel relays.
- Terminal strips.

1.10.5. Door Mounted Components

NOTE: While the controller incorporates some of this equipment, the specified items as detailed below are STILL REQUIRED and shall be mounted on the door.

- As per the Deep Sea DSE 7320 Controller fitted with DSE Webnet DSE890 complete with separate GPS and GSM antennae.
- 3 x Flush mounted M.D.I. 96 x 96mm dial ammeters suitably scaled.
- 1 x Flush mounted 96 x 96 mm dial voltmeter, 0 - 500VAC.
- 1 x Flush mounted voltmeter selector switch with off, phase to phase and phase to neutral positions.
- 1 x Flush mounted running hour meter.
- 1 x Emergency stop push button - "Latching type".
- 1 x Engine alternator charge indication.

1.10.6. Control Equipment Requirement

Control systems may not consist of the electromagnetic relay type. Only the Deep Sea DSE 7320 fitted with DSE Webnet DSE890 Gateway complete with separate GPS and GSM antennae or equivalent (Subject to approval by DPW prior to the closure of the Tender) solid state programmable systems will be accepted.
The solid state controller and associated systems wiring shall be to the control system manufacturer’s guidelines and shall be adequately protected against transient over voltages arising from lightning effects, switching surges, power system surges or mains and alternator borne noise/interference. Full details of the suppression systems are to be provided at tender. Wiring to and from the solid state programmable controller is to be screened as necessary to prevent electrostatic and magnetic interference from adjacent wiring/systems.

SPECIFICATION FOR CONTROLLER

FRONT PANEL INDICATORS AND DISPLAYED MESSAGES

The controller status including Warning and Shutdown/ Critical alarms shall be indicated by a combination of LCD and messages on the LCD display.

ITEM			**Condition**	**Display LCD warning message**		**Shut down**
HIGH ENGINE TEMPERATURE	X	X				
LOW OIL PRESSURE				X		X
OVER SPEED				X		X
UNDER SPEED				X		X
LOW FUEL AT 30% OF			X	X	X	
CAPACITY						
NO FUEL AT 10% OF CAPACITY			X	X		X
LOW BULK TANK				X	X	
LOW WATER				X		X
START FAILSAFTER CRANKS AT 3 10 SECOND INTERVALS.			X	X		X
EMERGENCY STOP			X	X		X
SHUTDOWN / CRITICAL			X	X		X
MAINS PHASE ROTATION FAULT				X		X
HIGH MAINS VOLTS				X		X
LOW MAINS VOLTS				X		X
MAINS ON			X	X		
MAINS ON LOAD			X	X		
ALTERNATOR ON			X	X		
ALTERNATOR ON LOAD			X	X		
ALTERNATOR PHASE ROTATION				X		X
HIGH ALTERNATOR VOLTS				X		X
LOW ALTERNATOR VOLTS				X		X
BATTERY VOLTS FAULT				X	X	
ALTERNATOR CHARGE FAULT				X	X	
AUTO			X			
TEST			X			
MANUAL			X			
MANUAL STAR			X			
MANUAL STOP			X			
MANUAL OR TEST (NOT IN AUTO)			X			
TIME DELAYS IN SECONDS						
MAIN FAILURE DELAY			10			
START-UP TIME			5			
MAINS RETURN DELAY			60			
COOL DOWN DELAY BEFORE SHUT DOWN.			120			

FRONT PANEL SWITCHES

As per the Deep Sea 7320 controller

PLANT OPERATION

The mode selector touch pad functions shall be as follows

OFF/RESET Control system off and alarm condition reset.

AUTO Automatic starting and stopping of the set dependant on the mains supply.

MANUAL Starting and stopping activated manually. In this mode the load will not be transferred in the event of a mains failure.

TEST The set will start automatically in this position. The load will be taken by the alternator in the event of a mains failure and will run off load.

LOGGING OF EVENTS

As per the Deep Sea DSE 7320 Controller fitted with DSE Webnet DSE890 Gateway complete with separate GPS and GSM antennae.

USER PROGRAMMABLE

As per the Deep Sea DSE 7320 Controller fitted with DSE Webnet DSE890 Gateway complete with separate GPS and GSM antennae.

1.11. Electrical

Cables between the generator set and control panel shall be supplied and installed in accordance with the requirements of the S.A.N.S. Wiring Code (S.A.N.S. 10142 – 1:2017 as amended).

1.11.1. Terminations

The cables are to be made off with suitable cable glands as C.C.G, Pratley or other approved. The cable glands at the control panel shall be secured to the gland plate in the base section of the panel and at the generator end to the terminal box.

The cable conductors shall be terminated with suitably rated hydraulic pressure crimped cable lugs.

1.11.2. Earthing

The neutral point of the generator shall be solidly connected, by means of an appropriate size of insulated earth conductor, to the earth bar in the alternator and in the panel. All plant, ancillary equipment and steel work in the stand-by plant room shall be suitably bonded together with an appropriate size of bare copper tape which shall also be connected to the earthbar.

An Earth Mat should be installed (if not already in place) of sufficiently low impedance to match the generator rating.

1.11.3. Phase Rotation

The Contractor shall ensure that the mains and generator phase rotations are identical. The existing phase rotation shall be determined prior to the changeover shutdown to ensure that the new set is connected with the same phase rotation.

1.12. Painting

The engine and generator shall be painted uniformly with best quality enamel paint in a colour approved by the Department.

The control panel shall be painted with best quality powder coated signal red paint.

1.13. Testing

1.13.1. Testing at Contractors Premises

An acceptance test shall be carried out at the Contractor's works to establish that the diesel generating plant and its ancillary equipment meets with the requirements of the specification. The Contractor shall give the consultant at least seven days' notice prior to testing the plant. In the event of the plant failing the test and having to be re-tested, at some future date, all expenses (including travelling) incurred by the consultant in attending the second test will be to the Contractor's account. All fuel used for the test will be for the tenderers account.

a) Simulate a mains failure to automatically start the plant from cold to test its ability to attain full rated speed and voltage and assume the full load in the specified time of ten seconds.

b) Test run the plant at full load for a period of one hour.

c) Immediately after the above specified run, without stopping the plant, run it for a further hour at 110 % load.

d) Test the plant with regards to voltage dip, voltage and frequency recovery, with a sudden application of various loads.

e) Test the plant for its ability to assume full rated load immediately on failure of the normal supply.

f) Test and demonstrate (by simulation only where actual Conditions could damage the plant and its ancillary equipment) the correct operation of the engine safety controls and alarms together with other alarms as specified.

g) Any other tests the client may consider necessary to establish that the diesel generator and its ancillary equipment as a whole is functioning correctly and in accordance with the specification.

NB:The Contractor shall provide necessary instruments and equipment for carrying out the tests. The test equipment shall be capable of producing 100 % load for one hour and 110 % load for a further hour continuously without interruption. The test load shall be adjustable and balanced over three phases.

The instrumentation shall be capable of recording and producing printed data pertaining to transient voltage dips, recovery time, applied load, etc, as specified in Clause 9.5.

1.13.2. Tests On Site

On completion of the installation of the plant, the following test shall be carried out.

a) Automatic starting and stopping with load change over. The load in this instance will be provided by the client.

b) Test by simulation only of the operation of the engine protection and alarm devices.

c) Any other tests which the consultant may require on site.

1.13.3. Testing and Commissioning

The Contractor shall test the entire installation and shall ensure that the installation is completed and commissioned in every respect and that there are no major defects prior to notifying the Department's Representative for the final inspection.

Upon successful completion of all testing the Contractor shall submit a fully completed test report together with a Certificate indicating that the installation fully complies with the Specification and all relevant Standards and statutory requirements.

1.14. Notices & Labels

1.14.1. Warning Notice

The Contractor shall provide and install in a conspicuous position in the plant room a clearly legible and indelible notice 450 x 450mm made from non-deteriorating material, preferably plastic with red letters on a white background worded to read as follows:

DANGER

THIS ENGINE WILL START WITHOUT NOTICE. TURN THE CONTROLLER OFF AND PRESS THE EMERGENCY STOP BUTTON IN BEFORE WORKING ON THE PLANT.

1.14.2. All labels shall be RED engraved letters on WHITE Ivorene glued with super glue or pop riveted to cover plates where applicable. Letter size shall be a minimum of 3mm.

1.15. Drawings

Within one month of the receipt of order the successful Tenderer shall submit prints of each of the following drawings for approval:-

a) General arrangement of the stand-by plant switchboard front panel.

b) Schematic of the complete electrical systems, including starter motor, battery and automatic battery charger.

c) Dimensioned layout of all plant in the canopy compartment.

1.16. Spare Parts

Tenderers must provide an assurance with their Tender that spare parts for the plant offered by them as a whole are readily available within the Republic of South Africa and to state where these spare parts are available.

1.17. Guarantee and Maintenance

1.17.1. General

The Contractor shall guarantee and maintain the Contract Works for a period of twelve months (12) after Works Completion of the plant. During the maintenance period the Contract Works shall be maintained as specified in Clause 21 by the Contractor and any defective material, equipment or workmanship (excepting proven, willful or accidental damage, or fair wear and tear) shall be made good with all possible speed at the Contractor's expense and to the satisfaction of the client.

At six monthly intervals (2) during the guarantee period of twelve months, starting from the date of Works Completion, the Contractor shall adjust and maintain the standby plant and its ancillary equipment in proper working order. As a minimum requirement the Contractor shall:

a) Check, top-up and replace if necessary, the fluid levels in the radiator, engine sump, fuel oil tank and batteries. Perform routine service and replace parts required for the service.

b) Test run the standby plant and ancillary equipment for a period of 15 minutes.

c) Wipe down the standby plant and its ancillary equipment and report on any evidence of any fluid leaks or other defects.

d) Fill in the standby plant logbook.

The cost of such inspections, maintenance, adjustments, repairs, etc., shall be included in the tender price, but the cost of renewing any part which may become worn through fair wear and tear, or damaged beyond the control of the Contractor (provided this is not due to unsuitable design) shall be excluded.

If during the guarantee and maintenance period the standby plant is not in working order for any reason for which the Contractor can be held responsible, then the Contractor will be notified and immediate steps shall be taken by him to remedy the defects. Should the standby plant defects be so frequent as to become objectionable or should the

equipment otherwise prove unsatisfactory during the guarantee period of twelve months, the Contractor shall, if called upon by the client, at his own expense replace the whole or such parts thereof as the client may deem necessary with equipment to be specified by the client. Approval - tacit or otherwise - of the equipment installed shall be considered as provisional only and shall not invalidate the client's right as indicated above.

1.17.2. Making Good

When called upon by the client the Contractor shall make good on site and shall bear all expense incidental thereto including making good of work by others, arising out of removal or reinstallation of equipment. All work arising from the implementation of the guarantee or maintenance of equipment shall be carried out at times which will not result in any undue inconvenience to users of the equipment or occupants of premises.

If any defects are not remedied within a reasonable time the client may proceed to do the work at the Contractor's risk and expense, but without prejudice to any other rights which the client may have against the Contractor.

1.17.3. Latent Defects and Failure to Comply with Specification

The client reserves the right to demand the replacement or making good by the Contractor at his own expense of any part of the Contract which is shown to have any latent defects or not to have complied with the Specification, notwithstanding that such work has been taken over or that the guarantee period has expired.

1.17.4. Qualification by Tender

Should any specified materials or equipment in the Tenderer's opinion be of inferior quality, or be unsuitably employed, rated or loaded, the Tenderer shall prior to the submission of his tender advise the consultant accordingly. His failure to do so shall mean that he guarantees the work including all materials or equipment as specified.

1.18. Completion of Works

Completion of works will occur and delivery shall be given only after the following procedure has been certified by the Department's Representative as having been carried out in accordance with the Specification:

1. After the defects are made good and approval of the Department's Representative is obtained, physical completion has been reported to the Department's Representative by the Contractor and the Department's Representative has given approval.

2. "Start-up" has taken place.

3. Commissioning and testing has taken place as specified and test results have been witnessed (where required), recorded and finally approved by the Department's Representative.

4. Spares, where specified, have been handed over to the Department's Representative.

5. Three copies of indexed loose leaf manuals containing complete Operating Instructions and Maintenance Manuals have been furnished to the Department's Representative after approval by the Department's Representative, for all mechanical and electrical systems, equipment and controls for all equipment or systems specified under this Contract

1.19. Training

After successfully testing and commissioning the installation, the Contractor will be required to thoroughly train and instruct at least two Operators/Supervisors designated by the school in the correct use, operation and supervision of the Generator installation. The Contractor shall allocate a competent member of his staff for this purpose and shall allow adequate time for this in his price.

A comprehensive operator-training programme shall be provided, and shall cover all aspects of the Generator Network installation so as to provide a first line local support to the School Staff, both operational and managerial. The training sessions shall comprise lectures and on-site (hands-on) demonstrations, and shall conduct over a minimum 2-day period. The Contractor shall provide a training plan and syllabus to the Department's Representative for approval. Approval of the training plan and syllabus shall be a condition for issue of a Certificate of Practical Completion for the installation. No training shall commence without the Department's Representative's approval of the final draft Operating and Maintenance Manual for the installation.

The training shall include the following topics as a minimum:

Hardware -

(a) Overview and functioning of system and equipment.
(b) Network and cabling.
(c) Components and field replacement.
(d) System maintenance and specific tasks related to preventative maintenance.
(e) Interpretation and understanding of the Operating and Maintenance Manuals, with specific reference to requirements in cases of corrective and breakdown maintenance.

Support-

(a) Trouble shooting problems /queries.
(b) Support programme and procedures.
(c) Support communications.

Training certificates shall be issued at the end of the training, when the Contractor is satisfied that the persons trained have an adequate understanding of how the system functions, and are able to operate the system effectively. Copies of the certificates shall be included in the operating and maintenance manual. A training register is also to be signed by members receiving the training. A copy of this register is to be included into the hand-over file.

1.20. Operating, Maintenance and Instruction Manuals

The Contractor shall supply three complete comprehensive sets of operating and maintenance manuals, complete with schematic control diagrams and complete spare parts list for both engine and generator.

The above manuals are to be handed to the authorized representative on completion of the installation.

In addition a complete schematic diagram of the power and control circuitry is to be mounted in a glass fronted wooden or non-ferrous metal frame and fixed to the canopy door adjacent to the generator control panel.

The Contractor is to provide a schedule containing particulars and part numbers of all major components e.g. relays, timers etc. of the control circuitry to facilitate the ordering of spares.

NOTE: Under no circumstances will Practical Completion be taken of the plant and equipment unless these requirements have been completed.

The Contractor shall be responsible for the compilation of a complete set of Operating and Maintenance Manuals. A separate Operating and Maintenance Manual for the Generator Network installation shall be provided and shall be part of on overall manual for the entire generator installation.

The manuals shall be bound in hardcover plastic-coated A4 lever-arch files as per 'Bantex' or similar and approved. Sections of the manuals shall be clearly partitioned using labelled coloured plastic sheets. Pamphlets, bound leaflets/booklets. And drawings shall be placed in clear plastic pockets.

The manual shall contain at least the following headings:

1. Introduction
1.1 Scope of the manual
1.2 General arrangement of the manual
1.3 Description of installation
1.4 Specifications

2. Schedule of equipment installed with pamphlets, names of Agents and Suppliers.

3. Parts and components list

4. Operating procedures

5. Maintenance
5.1 Purpose of maintenance
5.2 Preventative maintenance
5.3 Trouble-shooting
5.4 Planned service and maintenance programme.

6. Breakdown maintenance and repair, and name, address and telephone number of Contractor and after hours service.

7. Appendices including testing and commissioning Generator.

8. Drawings and diagrams

A draft copy of the Operating, Maintenance and Instruction Manual shall be submitted to the Department's Representative for approval. The manual will be reviewed and checked by the Department's Representative and returned to the Contractor with comments, where necessary. The Contractor shall make the necessary changes and amendments to the manual to incorporate the Department's Representative's comments.
The final draft copy of the Operating, Maintenance and Instruction Manual shall be submitted to the Department's Representative at least one week prior to commencement of testing on commissioning. This set of manuals will not be accepted without the Contractor's verification of the information contained in the manual and the professional language editing thereof. The Department's Representative shall return the manual to the Contractor, who shall make the final corrections.

The Contractor shall include all test certificates and all details of the Generator Network installation. All such information and certificates shall be to the approval of the Department's Representative. Electronic copies of the final manual shall be handed over to the department's Representative upon approval of the Operation, Maintenance and Instruction Manual.

Approval of final Operating, Maintenance and Instruction Manual shall be a prerequisite for issuing of a Certificate of Practical Completion for the installation.

The Contractor shall also provide copies of CD's containing all the "As-Built" record drawings of the Generator Network installation.

2. SCHEDULE OF EQUIPMENT

The Schedule of equipment offered shall be fully completed by the Tenderer.

OUTDOOR TYPE STANDBY GENERATOR SET

GENERAL

Tenderers must complete the following schedule of information and are to submit with their Tender comprehensive literature on the equipment offered including countries of origin.

FAILURE TO COMPLETE AND SIGN THIS SCHEDULE IN ITS ENTIRITY SHALL LEAD TO DISQUALIFICATION OF THE BID. EACH PAGE TO BE INITIALLED BY TENDERER.
DIESEL ENGINE

a) Make and Model .....…….

b) Type (two or four stroke)……

c) Performance Parameters

i) Rated output at sea level:Prime Power: ……kVA / kW. Standby Power.……...…….…….kVA / kW.

ii) Rated output at ……..….metres above sea level (Altitude of hospital/Institution)

Prime Power ……kVA / kW.

Standby Power..……..…….kVA / kW.

iii) Ambient air temperatures at ……..….metres above sea level (Altitude of Institution)

Minimum o C.…….

Maximum o C.……

d) Governed speed ……..RPM

e) Number of cylinder ……

f) Diameter of cylinders ……..mm

g) Stroke of piston ……mm

h) Piston speed ……m/minute

i) Type of air cleaner …….

j) Type of lubricating oil filter …….

k) Make and type of injection system ……...……

l) Type and number of fuel filters ……..

m) Manufacture and type of turbo-charger ……..……

n) Manufacturer and type of governor

……

o) Max cyclic variations ……..

p) Speed variation for sudden release or application of load: i) Temporary ……

ii) Permanent ……

q) 100% Rated full load may be applied seconds after initiation of starting sequence

…….……

r) Specific fuel consumption at full load. Litres/ HR (submit curves)

……..

s) Air quantity required for engine cooling ……cu.m/min.

t) Cross sectional area of radiator air discharge outlet required

……..

STARTING BATTERY

a) Manufacturer …….

b) Type .....……..

c) Capacity.....……

d) Voltage.....…….

ALTERNATOR

a) Make .....…….

b) Type .....…….

c) Type of bearings

.....……..

d) Method of lubrication

.....……..……..

e) Rated load at 0.8 power factor at 400 / 230 volt 50Hz 3 Phase

f) Continuous rating ……Kva…….Amps…….

g) Efficiency of alternator at full load

.....……..

Output voltage within governed speed range at:

i) No load …….....Volts

ii) 50%load …….....Volts

iii) 100% load …….....Volts

iv) 110% load …….....Volts

h) Method of voltage regulation .....…….

CONTROL CUBICLE

a) Manufacturer …….....

Dimensions of control cubicle:
Length…… …….…….....mm
Width …… …….....mm
Height...…….....mm

b) Type of control equipment.

.....……..……..

c) Type, make and rating of 4 pole by pass switch

.....……

d) Type, make and rating of 4 pole motorised change-over switch

……..

e) Rupturing capacity at rated voltage of main circuit ….....K.A.

f) Method of tripping employed in main circuit breaker

…….....

h) Range of load setting of main circuit breaker

…….....

i) Electrical and mechanical interlock provided: YES…… NO…… TYPE ….....

VOLTMETER–COMPULSORY INSTALLATION

a) Make and type

…….....

b) Dial dimensions …….…….....

c) B.S.S. accuracy …….…….....

MAXIMUM DEMAND AMMETERS-COMPULSORY INSTALLATION

a) Make and type …….....

b) Dial dimensions …….....

c) Time lag …….....

d) B.S.S. accuracy …….....

FREQUENCY METER COMPULSORY INSTALLATION

a) Make and type …….....

b) Dial dimensions …….....

c) B.S.S. accuracy …….....

SELF BUNDED FUEL TANKS

Base tank size …….…….

Bulk tank size. …….

Bulk tank manufacturer and model number ……...

EXHAUST

Exhaust material ……..……

Exhaust material, silencer and outlet pipe ….. ……..

MASS OF PLANT …….....kg

OVERALL DIMENSIONS OF PLANT

Length .....…….

Height .....…….

Width .....…….…

TYPE AND RATING OFE QUIPMENT TO BE USED FOR LOAD TESTS

.....……

COMPANY NAME AND ADDRESS OF BULK TANK INSTALLATION

……

……

IS THE TENDERER A DIESEL GENERATOR SET MANUFACTURER WITH LOCAL MANUFACTURING AND BACKUP FACILITIES …….YES / NO…….
IS THE TENDER 100% TO SPECIFICATION ….....YES / NO……

If the answer is NO, provide reasons for the deviation from the specification.

_____

_____

_____

_____

_____

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

COMPANY STAMP

PART 6: BILLS OF QUANTITIES

PREAMBLE

1. The descriptions in these bills of quantities shall be read in conjunction with the specification.
2. The unit rate for each item in the Bills of Quantities shall include for all materials, labour, profit, transport, etc., everything necessary for the execution and complete installation of the work in accordance with the description.
3. The Bills of Quantities shall not be used for ordering purposes. The Contractor shall check the lengths of cables and overhead conductors on site before ordering any of the cables. Any allowance for off-cuts shall be made in the unit rates.
4. The rates shall exclude Value-Added Tax and the total carried over to the final summary.

PSM 1 MECHANICAL SPECIFICATION

FOR THE

REFURBISHMENT OF AMERSFOORT WATER TREATMENT WORKS PLANT

AMERSFOORT WATER TREATMENTWORKS MECHANICAL SERVICES SPECIFICATION (PART M2)

TABLE OF CONTENTS

AMERSFOORT WATER TREATMENT WORKS
MECHANICAL SERVICES SPECIFICATION
(PARTM2)

1.0 DESIGN PHILOSOPHY

1.1 Introduction

The following documents shall outline the technical specifications and performance requirements for thedesign and installation of the bulk water pumps at Amersfoort Water Treatment Works .

The following Mechanical Services Equipment systems shall be designed, specified and installed underthis Works Information Document:

- Raw water Pumps
- Amersfoort Pump station
- Perderkop Pump Station
- Daagakral Pump Station.
- Sand Filter sump pumps
- Valves
- Pipe works

The design of the above-mentioned centrifugal pumps is on the following standards :

All design standards for the centrifugal pumps shall be subject to the latest amendments andeditions of the following standard specifications:-

SANS 10400	:	National Building Regulations
BS 5304	:	Code of practice for safeguarding of machinery
SANS 9096-1: 1994	:	Testing of welders, where applicable to the type of welding required
BS 292 Part 1: 1987	:	Dimensions of ball bearings, cylindrical and spherical roller bearings
SANS 10162-4	:	Structural use of Steel Part 4: The design of cold-formed stainless steel structural
SANS 1044-3	:	Welding Part 3: The fusion of steel (including stainless steel): Testsfor the approval of welding procedures
SANS 10044-4	:	Welding Part 4: The fusion welding of steel (including austenitic stainless steel): Tests for the approval of welders working whereweld procedure approval is not required.
SANS 10064	:	The preparation of steel surfaces for coating
SANS 10102-4	:	Selection of pipes for buried pipelines Part 1: General ProvisionsSANS
10104	:	Hand railing and balustrading (safety aspects)
SANS 10111-2-1	:	Engineering Drawing Part 1: General principles Engineering Drawing Part 2: Geometric Tolerancing Section 1

SANS 10341	:	Installation and maintenance of bearings – General
guidelines SANS 1700-5-9	:	Fasteners Part 5: General requirements &
material properties		Section 8: Corrosion resistant stainless steel fasteners-Bolts, Screws & Studs
SANS 1700-5-10	:	Fasteners Part 5: General requirements & material
properties		Section 8: Corrosion resistant stainless steel fasteners-
Nuts BS EN ISO 14847:1999	:	Rotary positive displacement pumps.Technical
requirements		
BS EN 734:1995	:	Pumps and pump units for liquids. Common safety
requirements		
BS EN 12162:2001	:	Liquid pumps. Safety requirements. Procedure for hydrostatic testing
BS EN 60041:1995	:	Field acceptance tests to determine the hydraulic performanceof hydraulic turbines, storage pumps and pump-turbines.
BS EN 60994:1993	:	Guide for field measurement of vibrations and pulsations in hydraulic machines (turbines, storage pumps and pump-turbines)
BS EN 22858:1993	:	End-suction centrifugal pumps (rating 16 bar). Designation, nominal duty point and dimensions
BS EN 23661:1993	:	End-suction centrifugal pumps. Baseplate and installation dimensions
BS EN 733:1995	:	End-suction centrifugal pumps, rating with 10 bar with bearing bracket. Nominal duty point, main dimensions, designation system
SANS 1123	:	Pipe Flanges
ISO 281	:	Rolling bearings -- Dynamic load ratings and rating life
BS 4999	:	General requirements for rotating electrical machines.
Specification		for standard dimensions
SIS 05 59 00	:	Pictorial Surface Preparation Standards for Painting Steel
SurfaceBS 5316 Part 2	:	Pump test codes

One of the main objectives of the design is to contribute towards sustainable development bymeans of utilizing water and energy efficiency in the design.

The plumbing and drainage works is engineered, specified and shown on drawings and set out inthis works information document and should be strictly adhered to. It however remains the responsibility of the main contractor to carry out the construction engineering of the works and ensure the installation complies with standard best practice plumbing and engineering principles. All specialist items shall be **complete systems** provided by the main contractor, installed and fully integrated into the **overall** system within which the special item must function. The

performance requirements shall be guaranteed by the specialist sub-contractor under the main contractor or plumbing sub-contractor.

All specialist items shall be guaranteed and maintained for 12 months from the date of Handovervia the Main Contractor (Commissioning Agent) and carry a 5 year latent defect guarantee.

Service Level Agreements must be included in tender documentation submittals for this contract. Pressure boosting pumps as specified under specialist items, shall render and guarantee the necessary pressure to operate the domestic water reticulation systems.

The selection of materials and plant shall be appropriate to suit the level of comfort required by the owner and shall be of a suitable quality to last for a design life span of between 20 and 25 yearswithout major refurbishment during this period.

The proposed materials of pipes fittings and plant shall be of a high quality, durable and requirelow maintenance and flushed as per SANS 10252 before commissioning and handover.

1.2 Centrifugal Pumps design Philosophy

Water supply pressure and flow to the building shall be maintained by means **one set** of variablespeed drive pumps located in each plant room. The pumps shall draw water the raw water intake, clean water reservoir and the sand filter backwash sumps

The water pump set performance specifications is as follows:

- High volume and high head centrifugal pumps
- The pump duty are as indicated in the next table
- Pressure shall be maintained by means of 2 variable speed drive pumps set controlled bya frequency drive.
- Amersfoort should have one duty and one standby pump.
- Dagaakral shall have one duty and two standby pumps
- Perdakop shall have one duty and one standby pump
- Pumps to operate alternatively and change over after a week in operation (flip-flop).
- The pumps shall not start and stop more than ten (10) times per hour.
- The pumps shall operate automatically but shall also be provided with manualchangeover switches.
- Amp meter shall be required per pump set including all necessary indicator lights, etc.
- All necessary alarms shall be provided to indicate alarm situations, such as high or lowwater levels etc.
- The specialist-subcontractor shall provide all necessary bases, base plates, frames,vibration pads, etc. for the pump sets and equipment.

- All cables shall be installed on approved cable trays or cable racks and supports.
- The pipe work shall be arranged in such a manner that the serviceable equipment, suchas pumps and valves, etc. can be removed and replaced without disturbing or disruptingthe operation of the system.
- Before ordering or manufacturing any pumps or equipment the specialist sub-contractor shall submit all necessary documentation for approval by the Engineer and thereafter the

  specialist Subcontractor shall submit for further approval all necessary workshop/fabrication drawings.
- Pump and equipment data submitted for approval shall be for the specific installation andduty and not in general.
- Pump specific duty points shall be determined and indicated for approval by the specialistSub- Contractor.

The specialist subcontractor shall determine the specific hydraulic head for each pump set fromthe actual pipe installation by means of testing the existing water installation. However for tendering purposes 25 % must be added to the static head to calculate the hydraulic head.

- Pump sets must be chosen for the highest efficiency possible.
- The pump sets shall be put into operation by the specialist Sub-Contractor and theyshall calibrate the systems as many times as necessary until it operates to the satisfaction of the Engineer and Commissioning agent.
- The pump installation shall only be accepted as complete once the Engineer issuesa completion/acceptance certificate.
- Pumps shall be installed on rubber line pads to prevent vibration transmission to theslab.
- The pump installation shall be provided as a complete system with a dedicatedcontrol panels and all required valves, piping ,switches sensors and monitoring

2.0 Design, Engineering and Specification

2.1General

All Mechanical Services such as plumbing and drainage works shall be included in this Sub- contract and the Main contractor shall be the responsible person to install in compliance with thegiven standards and as per detail design and centrifugal pump particular specification 9.

All sanitary ware including all fittings such as taps, mixers and showers shall all be provided by plumbing sub-contractor and the plumbing sub-contractor (Unless otherwise noted) shall be responsible to install all necessary plumbing and drainage services and install all the above mentioned sanitary ware and fittings and taps etc., and be responsible for the correct operation ofthe complete installation.

All specialist installations such as the pumping systems etc. shall be supplied and installed by the relevant specialist Sub-Contractor as a Sub-Contractor to the plumbing Sub-Contract. The plumbing Sub-Contractor shall be responsible for the entire installation.

The Main Contractor shall be responsible for the on-site co-ordination of all these elements into the overall plumbing system to render a complete operating system that performs to the requiredcriteria.

The Engineer will provide all the required performance criteria in this Works Information Documentand drawings to facilitate this process.

All work shall be carried out strictly according to the relevant SANS Specifications, Codes of practice and standards and all other applicable relevant standards. The engineering, quality control and inspections, selection of equipment and materials, preparation of workshop drawings, drawings, testing, adjusting, commissioning and preparation of operation and maintenancemanuals, are to be executed in a systematic manner and programmed, under the Main Contractor's general supervision and direction.

2.2 Material Specification

2.2.1 General

The proposed materials of pipes fittings and plant shall be of a high quality, durable and require low maintenance and be safe to use and operate and be compatible with the specificwater quality of the project.

The pipe manufacturer shall train all plumbers of the plumbing contractor to carry out the pipeinstallation and these approved trained plumbers shall carry suitable identification to prove that they are trained and can be identified on site where the work is carried out. No other untrained plumber shall be allowed to work on the installation of piping on the project.

Completed sections of the piping systems shall be tested and the testing shall not be postponed until the final completion of the systems as per the Commissioning procedures outlined in the Commissioning guide specifications documents.

The piping shall be ‘pressure’ tested as per the pipe manufactures requirements and the pressure testing required as per SANS 10252-1 whichever is greater.

The pressure shall be maintained for a minimum period of 24 hours. All testing shall be witnessed and photo recorded by an independent approved QA officer. (Approved means approved by Engineer).

The piping system shall be charged with water constantly and the as-built position shall be

marked on a drawing to prevent damage when other installation is done at a later stage. Only material from one MANUFACTURER shall be used in the various categories below(Unless otherwise noted). This affords the supplier the opportunity to provide regular QAchecks and issue reports. The piping manufacturer shall be accepted by the engineer andowner prior to commencement of construction.

2.3 Construction and Investigation

The construction will include the production of workshop drawings complete with pipe configuration, where the Engineer deems it necessary, for approval by the Engineer.

The Sub-Contractor shall be responsible for all elements of the systems and the integration into the complete specified system according to the required performance. The Sub-Contractor shall provide the total overall guarantee of the complete works. The Sub-Contractor shall carry out on-site investigations to obtain the "as-built" situation before construction of any system. The Sub- Contractor shall be responsible to ensure that all necessary sleeves in concrete slabs and beamsare installed before concrete is poured.

2.4 Supply of Plant and Materials

All sanitary fixtures and fittings, materials, plant and equipment shall be generally available locallyand comply with SABS standards and SABS approval. All imports shall be subject to special permission being granted by the Engineer. The supplier of materials, plant and equipment shall provide full back- up guarantees for it. These written guarantees shall be submitted to the Engineer before ordering or procurement.

The pipe manufacturer/supplier shall provide guarantees for the pipe materials against defects and the subcontractor shall be liable for the costs of damages due to any failure relating to defective materials. These guarantees shall be submitted prior to construction commencement.

Plant and equipment such as pump-sets and the hot water generation plants shall be factory witness tested and inspected and approved by the Engineer before dispatch to the site for installation.

2.5 Fixing of Materials

2.5.1 General

All pipes and fittings shall be installed strictly in accordance with the requirements of the relevant SABS Standards, Codes of Practice, Institutional Requirements and the Manufacturers'/Suppliers' requirements, all of which shall be approved by the Engineer priorto construction.

Pipes shall be "fixed" and not allowed to "swing", and ONLY approved prefabricated doublehanger pipe supports/brackets shall be used and installed according to the manufacturer's installation and requirements.

The approved manufacturer shall specify and guarantee the method of fixing to concrete andother structures including the support spacing for the various pipe sizes and mass (with its contents).

- Minimum support spacing shall be specified by the pipe manufacturer for the variouspipe diameters.
- Appropriate separation shall be provided between dissimilar materials with specificreference to Mild / Stainless steel and copper.
- The complete pipe installation shall be cleaned and sterilized according to SANS10252-1.
- Appropriate provision shall be made for thermal expansion of the piping installation, airreleasing and backflow prevention, where necessary.
- Water hammer shall be eliminated by means of suitable water hammer arrestors andsuitable pipe anchors and supports, where necessary.
- Approved flexible couplings shall be provided between pumps and the pipe installation.
- Pipes shall only pass in sleeves through walls, columns and beams and other structures.
- All fittings and equipment shall be provided with a shut-off facility such as a valve, angle valve or ball-o-stop.
- Pipes shall be installed in such a manner as to allow easy access for maintenance andoperation.
- All pipes where fixed or supported with metal supports or brackets, shall be insulated with a suitable material, where necessary for dissimilar materials.
- Only pipes from one approved manufacturer shall be used and no other pipes from other manufacturers shall be allowed on site or mixed with any other brand or type. Unless otherwise specified.
- The mark of the approved manufacturer shall be clearly displayed. If any problem occurs on the piping during or after the completion of the installation then it shall be

deemed that the pipes have been provided by the approved manufacturer.

- The approved manufacturer shall provide guarantees for the integrity and suitability and compatibility of the pipes and with the water to be used in the installation.
- The pipes and fittings shall be guaranteed against any structural failure, pitting or anyform of corrosion or microbial attack.
- The approved manufacturer shall submit in writing all his requirements and specifications for the plumber/subcontractor to install the pipe work and to enable himto provide the guarantee.
- The manufacturer shall specify the method of jointing and guarantee it.
- The subcontractor shall provide and install a schematic diagram of the water pipe installation on block board with a plastic cover to be mounted on a wall in an appropriate position. All valves and important fittings and equipment shall be numberedand indicated their functions explained. The operation and emergency steps to be taken in case of emergency.
- All pipes installed across expansion joints of the building shall be provided with suitableexpansion fittings. Pipes shall not be fixed in these positions but shall be supported toallow movement.

3.0 Labelling of Systems

3.1 Pipe Service Identification

When necessary, all pipes and fittings shall bear acceptable markings for the purpose of identification. In installations where services are grouped together (such as in access shafts or ducts), all pipes shall be suitably marked in accordance with SANS 10140-3.

All piping shall be marked showing the following as per the table below:

Service (Pipe content)	**Service Reference**	**Identification / Flo-code Colour**
Mains Cold Water	MWS	Dark Blue
Boosted Drinking Water Service	BDWS	Dark Blue
Boosted Cold Water Service	BCWS	Dark Blue

Boosted Softened Water Service	BSWS	Dark Blue
Domestic Cold Water Services	DCWS	Dark Blue
Condensate	Condensate	Dark Blue
Hot Water Service	HWS	Crimson
Hot Water Return Service	HWRS	Crimson
Sanitary Drainage (Soil and Waste)	SD	Brown
Sanitary Drainage Vent Services	SDV	Brown

- Colour coding bands at regular intervals as specified by the SABS codes for each service.
- Painting of entire piping system.
- All exposed pipes, supports and equipment shall be cleaned, treated and painted with one coat suitable primer, one undercoat and one finishing coat of high gloss enamel paint.
- Direction flow arrows.

3.2 Numbering of Valves and Equipment

When necessary all valves, pipe accessories and equipment shall bear acceptable markings for the purpose of identification in accordance with SANS 10140-3. All pipe accessories shall be marked with a metal tag, numbered by means of an engraved number and locked with a galvanised or chromed chain and a master keyed padlock in terms of the building master key schedule.

All valves, meters and general pipe accessories' numbers shall be indicated on the as-built drawings and three master keys shall be handed over with the O&M Manuals to the facilities manager.

4.0 Special Items

The Subcontract includes a number of special items which shall form part of the plumbing and drainage installation. The specialist sub-contractor shall be responsible for the procurement, construction, and completion and commissioning of the complete systems which shall comply strictly with the performance specifications. The specialist sub-contractor shall guarantee that each system fully complies with the performance specifications. Full construction design details, work shop drawings, and specifications shall be submitted to the Engineer for approval before any manufacturing.

It shall be noted that the specialist sub-contractor is responsible for the "manufacturing and construction engineering" of these systems and to guarantee that it shall operate as per the Engineers performance,

design criteria, but all these systems shall be approved by the Engineer before manufacturing and installation on site.

The specialist sub-contractor shall guarantee the required performance and the satisfactory operation of the special items.

5.0 Commissioning and Testing of Systems

The plumbing system shall be commissioned in accordance with the independent commissioning agent's requirements and specifications. The sub-contractor is to ensure that they all systems are to be installed, tested, calibrated and commissioned in accordance with these requirements which includethe following:

6 Operation and Maintenance (O&M) Manuals

The Operating and Maintenance manuals shall consist of the following:

- List of Contents (Index)
- Introduction
- General description of the functions of each of the systems of the plumbing and drainage works,i.e.:
- Raw water pumps.
- Clean Water Pumps.
- Detailed description of each element of each system, how it functions, how it operates and how tomaintain it and what attic stock or tools to carry.
- Full as-built drawings and detailed drawings, brochures and catalogues for each system and eachelement of each system.
- The format of the O & M documentation shall be A4 and shall be a specially bound document withhard cover and with metal ring binding. (All drawings and details shall be reduced to A3 format andfolded into A4 format.)
- The names, addresses and tell/fax numbers of all responsible persons and manufacturers/suppliers shall be listed in the O& M document.
- A full list with reference numbers shall be included to enable the facilities Operating and Maintenance staff to order materials and equipment.
- Colour diagrams shall be provided to illustrate the operation and function of each system with reference to the relevant as-built drawings (floor plans and process and instrumentation diagrams)and brochures of equipment.
- Diagram must be laminated and fixed in plant room wall along with emergency contacts details.
- Full Commissioning Data As per the requirement set of by the Independent CommissioningEnginee

7.0 Quality Assurance (QA) and Quality Control (QC) Process

The importance of the QA checklists is to check what has been done, that it was done correctly, but alsoto find out what was not done and left out by mistake.

Drawings and the works information document are part and parcel of the QA process and should be methodically checked against the work done.

The checklists and checking of the work, is not "an activity" that must be carried out once the work hasbeen completed, but is a "process" to be followed from the planning of the construction work right up tothe completion and handing over of the project.

The duty and role of the design engineer is to carry out spot checks, monitoring, and quality audits and toensure that the Main contractor is carrying out a quality assurance system.

The results of spot checks will indicate the effectiveness of the QA process and if not satisfactory, theengineer could require more detail or in depth auditing from the Main Contractor or his representative. The checklists should have space next to each item for signature by the plumber, the QA supervisor ofthe plumber, the Main contractor and the Engineer.

8.0 Scope

This section covers the activities to be carried out by the contractor both on and off the construction siteto provide and install all systems under the Mechanical Services scope of works.

- The various activities shall be inspected and approved step by step and final approval shall only be given by Engineer.
- The Contractor shall notify the Engineer or his representative when each activity is completed andready for inspection. No work shall be covered before inspection and approval in terms of the approved QA system.
- All work shall be carried out strictly in accordance with the requirement of the specifications and asshown on the drawings and detail drawings.
- All details shall be strictly adhered to and no deviations shall be allowed unless prior approval hasbeen obtained in writing from the Engineer.
- All relevant statutory requirements and regulations shall be adhered to.
- Only competent artisans shall be employed to carry out the construction and installation work.
- The construction and installation procedures and activities shall be discussed at the start of thecontract at a "kick-off" meeting and shall be mutually agreed upon by all relevant parties.
- The Main Contractor shall produce and submit a construction programme for approval beforecommencing with work on the site.
- All requests for inspections, approvals and information shall be in writing.
- For further details of contractual obligations, specifications and other requirements refer to thecontract documentation.

- The Main Contractor is responsible for all safety measures and procedures.

8.1 The Contractor shall carry out inspections and tests according to his own internal QA system and provide proof of it to the Engineer.

- The Engineer will only inspect the works after the sub-contractor's QA has given written no- tice that his quality checks are completed. A copy of the checklists must be submitted to the Engineer.
- The Contractor shall submit all 'As-built drawings' and maintenance and operation manuals as required by the Engineer.
- All ‘As Built’ drawings and checklists for each area must be submitted on a monthly basis withthe plumbing claim.
- The Contractor shall provide all certificates of compliance to statutory or other regulations priorto procurement.
- After installation of works all guaranties must be provided.
- It is the duty of the Contractor to keep all the Quality Assurance records up to date and to providecopies to the Engineer when he requires it.
- All Quality Assurance records shall be kept on site and shall be made available for review up-on request by the Engineer.
- The plumber must mark all pipe penetrations on concrete structures. Approval from thestructural Engineer must be obtained prior to core drills.
- All drainage pipes and fittings shall be installed strictly to the manufacturer’s specifications, SABS Codes and other relevant requirements.
- All piping shall be installed according to SANS 10252.1.
- All pipe diameters shown on drawings are the MINIMUM INTERNAL diameter required forhydraulic flow in the pipes.
- Pressure testing of the pipe system
- Produce a snag list and commence immediately with all remedial or outstanding work. Put allsystems in operation and demonstrate to and train client’s maintenance staff.
- Submit as built drawings and maintenance and operation manuals.
- Provide all guarantees.
- The Quantity Surveyor shall be informed of each step to make the necessary measurementsfor payment.
- List all other relevant activities as provided for in the construction program

NOTE:

The plumber shall locate/set out positions of sleeve pipes on site according to the Engineers. Before concrete is placed the plumber shall confirm in writing that all sleeve pipes have been placed.

9.0 Duties of Quality Assurance (QS) Supervisor of the Contractor / Sub -Contractor

This section covers the duties and activities which the QA Supervisor is expected to perform and carryout on site including the administration procedures and inspections for which he will be responsible.

The purpose of this section is to highlight certain aspects of site inspections and to guide the Supervisor toperform his duties in the most efficient manner.

It is an attempt to indicate to the QA Supervisor what to "look" for when he carries out inspections.
The quality of the work shall be inspected, tested and approved as per agreed milestones. Agreed checklists must be issued to the Engineer at the time periods agreed. However the Engineer will be responsible for the final acceptance and Engineer's completion certificate.

The QA Supervisor shall be mainly responsible for checking and supervising the quality of workmanshipand also that the materials and equipment comply with the specifications.

Proposed variations, revisions and discrepancies of the designs shall be referred to the Engineer for approval.

It is not the duty of the QA Supervisor to do any redesign on site.
He shall keep the Engineer fully informed of all his activities as well as those of the Contractor on a monthly basis. Formal meetings will be scheduled as per the Engineer’s discretion and request.

All his records shall be in writing and shall be submitted to the Engineer on a monthly basis.
The QA Supervisor should never instruct work to be carried out, which is not specified or called for in the contract documents or drawings.

10.0 References

The following documents should be studied carefully and the instructions should be followed and strictlycarried out:

- Works information document.
- Contract documents.
- Contract drawings and details.
- Contract programme.
- Contract site-meeting minutes.
- Site instruction book.

- Site quality control book.
- Relevant SANS codes of practice.
- Relevant SANS specifications.
- National Building Regulations.
- All other relevant documents.
- Forms for records.

11.0 "Kick- Off Meeting - Agenda"

Arrange a "kick-off" meeting with all concerned parties and discuss and explain the Quality assurance system and procedures which shall be adopted and which shall be strictly followed. Discuss and agree on the various construction stages and when and how inspections are to be requested and approvals to be obtained. The Contractor must be made aware of the fact that he shall not proceed from one construction stage to another without the written approval of the Engineer. The various stages for whichhe must obtain the above mentioned approvals should be clearly indicated and noted. At this meeting the Contractor shall submit his QA system, which shall contain all the important aspects of a QA system.The Contractor shall also submit his construction program. The minimum time of notification of inspections required by the Engineer shall be agreed and noted (refer to contract document).The frequency of site meetings and the time and dates thereof shall be agreed and noted. All other relevantaspects shall be discussed and agreed. Verify that supports are at the specified intervals, etc. Check forany damage done to pipes, fittings and other materials during construction and installation. Upon completion of each section or stage, the QA Supervisor shall compile a snag list and keep checking it until the work is approved.

12 Site Meetings and Inspections

The QA Supervisor shall conduct regular site inspections. At the inspection the progress of the Contractor shall be discussed and recorded. Conformance with the construction program shall be monitored and recorded. Reasons for delays if any shall be requested from the Contractor and it shall be minute.

Regular site meetings and inspections shall be held. The QA Supervisor shall keep the minutes. Construction progress and all other relevant matters shall be discussed and recorded. A general site inspection of the works shall be conducted and all interested parties must attend.

13 Progress Reports

The QA Supervisor shall compile and submit detailed reports for the Engineer’s attention on aregular basis:

- The reports shall cover the following aspects:
- Areas checked.
- Services checked.
- Quality of work inspected.
- Remedial action taken, if needed.
- Training of workers for pipe material.
- Inspection frequency of supplier and comments if any.
- Progress of works on site.
- General report back on all his/her duties as outlined above.

13.1 Check Lists

The checklists will be issued to the contractor at the beginning of the project and must be implemented by the sub-contractor immediately. See Annexure A for QA checklists.

13.2 Plumbers Certificate

Once works completion are complete for all the above mentioned services, the plumber shallissue the following certificate.

Date: _____

Project name:

Subject: PLUMBING INSTALLATION COMPLETION CERTIFICATE

FOR INSTALLATION: _____ RESPONSIBLE PLUMBER:_____
REGISTRATION NO: -

We hereby declare that the above mentioned installation was carried out under the control of theUnder-signed registered plumber who complies with the requirement of SABS 0400, AIS and themanpower Training ACT. 1931 (Act no 56 of 1981).

The work was inspected and tested by the responsible plumber in compliance with SABS PP2, SABS P7 (1) (2)(P7 (3) is not applicable due to the rational design) and SABS PP26/PP27.

The workmanship and installation was carried out in general compliance of SABS 0252. Inspected, tested and disinfected according to SABS 0252 9.2.

The workmanship and the installation are guaranteed for a period of_____from the completiondate as on_____.

A complete set of AS-BUILT drawings is herewith submitted for record purposes, stamped andsigned by the responsible plumber. (The set consists of one colored set and two plain sets.)

Signed by:

(PIRB Registered responsible plumber) REGISTRATION NUMBER

PARTICULAR SPECIFICATION MECHANICAL CENTRIFUGAL PUMPS

PARTICULAR SPECIFICATION M18: MECHANICAL CENTRIFUGAL

PUMPSCONTENTS

M18.1 SCOPE

This specification covers the detailed design parameters, manufacture, supply, installation, test and commissioning of Centrifugal Pumps. The Specification shall be read in conjunction with that of the Project Specification.

M18.2 INTERPRETATIONS

M18.2.1 Abbreviations

In this Specification the following abbreviations will apply:-

ANSI	:	American National Standards Institute
ASTM	:	American Society for Testing and Materials
BS	:	British Standards Institution
SANS	:	South African National Standards
SIS	:	Swedish Institute of Standards
DIN	:	Deutsch Industry Normen
ISO	:	International Organisation for Standardization
ASME	:	American Society of Mechanical Engineers
SAECC	:	South African Electrolytic Corrosion Committee
AGMA	:	American Gear Manufactures Association

M18.2.2 Standards

All design standards for the centrifugal pumps shall be subject to the latest amendments and editions of the following standard specifications:-

SANS 10400	:	National Building Regulations
BS 5304	:	Code of practice for safeguarding of machinery
SANS 9096-1: 1994	:	Testing of welders, where applicable to the type of welding required
BS 292 Part 1: 1987	:	Dimensions of ball bearings, cylindrical and spherical roller bearings
SANS 10162-4	:	Structural use of Steel Part 4: The design of cold-formed stainless steel structural
SANS 1044-3	:	Welding Part 3: The fusion of steel (including stainless steel): Tests for the approval of welding procedures
SANS 10044-4	:	Welding Part 4: The fusion welding of steel (including austenitic stainless steel): Tests for the approval of welders working where weld procedure approval is not required.
SANS 10064	:	The preparation of steel surfaces for coating
SANS 10102-4	:	Selection of pipes for buried pipelines Part 1: General Provisions
SANS 10104	:	Hand railing and balustrading (safety aspects)
SANS 10111-2-1	:	Engineering Drawing Part 1: General principles Engineering Drawing Part 2: Geometric Tolerancing Section 1

SANS 10341	:	Installation and maintenance of bearings – General guidelines
SANS 1700-5-9	:	Fasteners Part 5: General requirements & material properties Section 8: Corrosion resistant stainless steel fasteners-Bolts, Screws & Studs
SANS 1700-5-10	:	Fasteners Part 5: General requirements & material properties Section 8: Corrosion resistant stainless steel fasteners-Nuts
BS EN ISO 14847:1999	:	Rotary positive displacement pumps. Technical requirements
BS EN 734:1995	:	Pumps and pump units for liquids. Common safety requirements
BS EN 12162:2001	:	Liquid pumps. Safety requirements. Procedure for hydrostatic testing
BS EN 60041:1995	:	Field acceptance tests to determine the hydraulic performance of hydraulic turbines, storage pumps and pump-turbines.
BS EN 60994:1993	:	Guide for field measurement of vibrations and pulsations in hydraulic machines (turbines, storage pumps and pump-turbines)
BS EN 22858:1993	:	End-suction centrifugal pumps (rating 16 bar). Designation, nominal duty point and dimensions
BS EN 23661:1993	:	End-suction centrifugal pumps. Baseplate and installation dimensions
BS EN 733:1995	:	End-suction centrifugal pumps, rating with 10 bar with bearing bracket. Nominal duty point, main dimensions, designation system
SANS 1123	:	Pipe Flanges
ISO 281	:	Rolling bearings -- Dynamic load ratings and rating life
BS 4999	:	General requirements for rotating electrical machines. Specification for standard dimensions
SIS 05 59 00	:	Pictorial Surface Preparation Standards for Painting Steel Surface
BS 5316 Part 2	:	Pump test codes

M18.2.3 <u>General Requirements</u>

This specification must be read in conjunction with the following specifications:-

M08: Particular Specification for Gearboxes

M21: Particular Specification for Pressure Pipework

E01: Particular Specification for Electric Motors

G01: Particular Specification for Colour Codes

G02: Particular Specification for Corrosion Protection

Automation and Control Design Standards Volume 8: Flow Measurement

Automation and Control Design Standards Volume 11: Temperature Measurement

M18.3 PUMPS

M18.3.1 Design Parameters

Centrifugal pumps shall have stable non-overloading characteristics and the shaft speed shall not exceed 1500 rpm where applicable.

The pumps shall be of the highest quality and shall be suitable for continuous operation over long periods with a minimum amount of maintenance at high-sustained efficiency.

In all applications, with exception of clear water pumps, non-clogging impellers must be used. Pumps shall be designed as to remove the impeller cover without moving the pump, pipe work or motor. Each pump shall have a drip tray with a 20 mm diameter galvanised drain pipe to the nearest drainage point.

The pump design shall make adequate provision for the balancing of residual axial thrust. Pumps shall be supplied complete with suction and delivery pressure gauges complete with air- bleed and isolating cocks, shaft couplings and guards, gland leakage piping, base plates, foundation bolts and other necessary equipment.

Detailed performance curves for the pump type shall be provided at the time of tendering.

The curves shall indicate the following:

- Head (metres) vs. flow (litres/second) - 0% to 120% duty flow
- Power absorbed in kW - 50% to 120% of duty flow
- Pump efficiency – 0% to 120% duty flow
- Net positive suction head curves required by the pumps at the specified flow rate.

The efficiency curve shall be flat over a wide range in order to provide efficient working at various pump operating conditions.

Pumps shall be able to operate without cavitation over a full range as specified without throttling. Pumps are required to operate continuously at an ambient temperature of 40°C.

The following quantities shall be guaranteed by the Contractor:

- Minimum flow rate of the pump at the specified total head.
- Maximum power demand at the specified total head.
- Minimum efficiency at the specified total head.
- Maximum net positive suction head required by the pump at the specified flow rate.

Multiple Units

Unless specified arrangements incorporating multiple units coupled in series in order to achieve the duty specified for each complete pump set shall only be offered as an alternative.

The mechanical equipment to be supplied under this Contract shall be installed, tested and commissioned on concrete structures, constructed by others, to the dimensions indicated on the construction detail drawings.

M18.3.2 Pump Casing

The pump casings shall be manufactured from cast iron or cast steel depending on the stresses corresponding to the required test pressures. Unless otherwise stated the dimensions and drilling of the suction and discharge flanges shall be SANS 1123 to the design pressures as specified but with a minimum of 10 Bar.

The pressure rating of the flanges shall at least be equal to the maximum static pressure plus the pump shut-off pressure.

Casings shall be designed for not less than the following working pressures or 1.5 times the actual working total discharge pressure, whichever is the greater.

Horizontal Split casing	:	1000 kPa
End Suction type	:	1000 kPa
Vertical Split Casing	:	600 kPa
Multistage	:	1.5 times working pressure.

End suction pumps

End suction pumps are arranged with a central suction connection and a tangential discharge connection. Both these connections shall be suitably flanged.

The casings shall be split at right angles to the shaft to enable the easy withdrawal of the impeller assembly. The volute casing shall be preferably a separate casing from the pump bearing and base assembly, but bolted and spigoted thereto.

For end suction pumps of more than 5.5l/s and not more than 70 l/s capacity, the casing shall be arranged to have a removable casing cover on the motor side so that the pump may be dismantled without disturbing the suction or delivery piping.

Horizontally split casings

These shall be double entry type casings, which are split on the axial centreline. The suction and delivery branches must be cast integral with the part of the pump incorporating the pump base.

The other half of the casing must be easily removable for an internal examination of the pump without the necessity of disturbing either the suction or delivery pipe work or rotating assembly.

The casing shall be fitted with suitable renewable corrosion resisting wearing rings and bushes in all positions where fine clearances require to be maintained. Wearing rings shall be made of high quality bronze or stainless steel.

All casings must be fitted with ceramic or stainless steel neck rings where fine clearances must be maintained between stationary and moving parts, to suit the fluid pumped.

Semi-concentric back pull-out design casings

The pump casing shall be semi-concentric back pull-out design, with the first half of the circumference after the pump outlet being cylindrical. The remaining circumference shall spiral outwards towards the flanged centreline discharge. The casing shall be manufactured from cast iron.

All casings shall be provided with the following tappings as a minimum requirement:-

- One suction pressure gauge tapping
- One discharge pressure gauge tapping
- One bleeder cock tapping
- One filling point tapping
- Suitable tapping or, where possible, internal drilling to provide water for the glands.

All casings shall be heavily ribbed and strengthened as necessary to resist hydraulic forces, and internal passages shall be smoothly finished to minimize hydraulic forces.

M18.3.3 Pump Impeller

Each impeller after machining and dressing shall be independently statically balanced and the complete rotating assembly with coupling shall be dynamically balanced.

All impellers shall be of a non over loading design.

Impellers shall be securely keyed and fixed to the shaft by means of suitable shaft nuts and locking sleeves.

All bolting devices must be securely locked so that they cannot accidentally come loose. Bolting devices shall be made of corrosion resistant materials.

M18.3.4 Pump Shaft

The pump shafts shall be of sufficient dimension in order to avoid excessive torsional or bending stresses and deflection.

The pump shaft shall be designed so that the critical speed of the rotating assembly is well above the maximum pump operating speed.

The impeller shall be secured to the shaft in such a way that it can be readily removed without any damage to the impeller and the shaft.

The shafts shall be protected by replaceable sleeves manufactured from non-corrosive material. The shaft shall be manufactured from stainless steel.

M18.3.5 Shaft Coupling

The pump and motor shall be connected by a flexible coupling in such a way as to prevent them from uncoupling regardless of which way the impeller may be rotating.

The coupling shall accommodate small axial, lateral and angular misalignments without imposing undue stresses on the shaft and bearings. The coupling shall be enclosed in a stationery solid-plate guard to the Engineers satisfaction.

M18.4 BEARINGS

All bearings shall be suitable for shaft rotation in both directions. All bearings shall be designed for a life of at least 100 000 hours at an (L10) rating. Bearings for the output shaft shall be designed

to withstand bending, up thrust, down pull, thermal expansion and radial loads imposedby the impeller.

The rotating assembly shall be positively located in the axial direction and thrust bearings will therefore be required.

For ease of lubrication all bearing grease pipes must be piped to grease nipples on the outer cover of the pump support frame.

M18.4.1 Bearing Housing

The bearing housing shall be manufactured from cast iron and shall be oil bath lubricated. Oil level sight glasses shall be provided with level markers for running and filling minimum and maximum positions respectively. These shall be arranged for easy viewing and shall take into account the angle of mounting.

The bearing housing and motor stool design shall provide accurate, self-aligning mounting for the flanged electric motor.

M18.4.2 Lubrication

In the case where oil lubrication is required, adequate provision shall be made for the cooling of the oil. The bearings shall be required to operate at temperatures no higher than 60°C.

Oil reservoirs of sufficient capacity shall be fitted with easily accessible oil level indicators, which are to be clearly marked in order to indicate the oil standing and running levels.

M18.5 GLANDS AND SEALS

Low pressure glands of the stuffing box pattern shall allow repacking without having to dismantle the pump.

If mechanical seals are offered they shall be manufactured from 316 SS to prevent the pump from leaking and shall be cartridge-type seals with O-rings and silicon carbide or tungsten carbide faces.

The cartridge seal shall be pre-assembled and pre-tested, requiring no adjustments and settings from the installer. Any springs required to push the seal faces together shall be shielded from the fluid that is to be pumped. The cartridge shall include a heat treated sleeve and an iron seal gland.

Full details of the seals and glands indicating the materials, finishes, clearances etc. shall be submitted with the Tender.

A spare mechanical seal for each size and type shall be supplied.

M18.6 VENT COCKS

Vent cocks shall be fitted at all high points to the pump casing. These cocks shall be adequately sized in order to allow the trapped air to be released freely.

An automatic air vent shall be fitted to each pump casing if specified. This device shall be suitable for the remote operation of an indicator to show the open and closed positions of the airvent.

M18.7 BASE PLATE

The base plate of the pump and motor shall be rigid. The pump and motor shall be situated on the upper face of each base plate, which shall be machined flat and smooth to ensure that the pump and motor are bedded properly without the use of spacers.

The pump/motor base plate shall be completely aligned prior to grouting and provision shall be made to grout within the base plate itself to facilitate vibration-free operation.

Base plates which have a mass greater than 200 kg shall have two jacking bolts at right angles with a lock nut at every corner of the unit.

M18.8 DRIVE UNIT

The pump shall be driven by a fixed electric speed motor and a speed reducer. Refer to Particular Specification E01: Electric Motors for a detailed specification for Electric motors.

M18.8.1 Gearbox / Motor Coupling

The coupling shall be fully rated to transmit the motor full load power and tested to prove the above features together with static and dynamic balance. The motor shall be coupled to the gearbox input shaft with either a V-belt or a flexible coupling. V-belts and couplings are to be provided with protective cover guards.

M18.9 GEARBOX

Refer to M08: Volume M08: Mechanical Specification for Gearboxes.

M18.10 MONITORING DEVICES

Full detail of all monitoring devices offered must be submitted with the Tender.

M18.11 PRESSURE GAUGES

Pressure gauges shall be fitted with an isolating cock, shall be vibration and shock resistant and shall be calibrated to read with an accuracy of ±1% of the indicated pressure. Three 20mm minimum diameter ball valves shall be employed to zero the gauge, to isolate it and to vent to atmosphere. A chemical seal shall be used to insulate the gauge from the media being measured.

The faceplate diameters of the pressure gauges shall be at least 100 mm. The gauges shall indicate the water pressure in kilopascal and shall have a range of a maximum of 50% higher than the normal maximum working pressure. All gauge glass must conform to internationally recognized standards. These standards include DIN 7081, BS 3463 and JIS B 8211.

A calibration certificate is to be provided with each pressure gauge.

M18.12 TEMPERATURE DETECTORS

If required oil lubricated bearings and glands offered shall be fitted with temperature detectors. The temperature detectors shall be PT100 – RTD's

If grease lubricated bearings are offered, the Tenderer will indicate in his Tender if temperature detectors can in fact be used. If temperature detectors are not feasible, an alternative means of monitoring bearings must be offered.

M18.13 NO-FLOW PROTECTION

(a) Each pump shall be protected against no flow by a flow meter installed in the discharge line from the pump.

M18.14 INDICATOR ON AUTOMATIC AIR VENT

If an automatic air vent is required for the pump casing, it shall be fitted with an indicator to indicate the open and closed positions of the air vent. The air vent shall be suitable for remote operation and air vent control shall be mounted on the control panel inside the pump station.

M18.15 GLAND LEAKAGE

If a gland leakage device is required in order to monitor the gland leakage it shall be supplied and fitted with adjustable alarm contacts designed to close when gland leakage rises to a pre- set value.

M18.16 PIPEWORK

All suction and delivery pipes shall be connected to the pump casing by means of flexible connections. All flexible connections shall be installed as close to the pump's casings as possible, and in any event, shall be between the suction valve and the pump casing and delivery non- return valve and the pump casing. In all cases the flexible connection shall be inthe section of piping of smallest diameter.

Double victualic joint are generally preferred for flexible connections, but approved re-enforced rubber bellow units are acceptable for low-pressure services.

All valves and pipework external to the pump casing and separated there from by means of flexible connections shall be securely anchored to prevent movement.

Refer to Particular Specification M21: Volume M21 Pressure Pipework for a detailed specification on pipework.

M18.17 HOLDING DOWN BOLTS

The contractor shall be responsible for the supply of all necessary holding down bolts for the machines supplied by him/her. The holding down bolts shall be manufactured from 316 SS.

All bolts necessary for assembling all equipment shall be supplied by the contractor.

M18.18 VIBRATION AND NOISE

The pumps as well as the motors will comply with the requirements of BS 4999. The Contractor may be requested by the Engineer to carry out vibration tests. The noise level shall not exceed 85 dBA at 1m.

M18.19 CORROSION PROTECTION

Refer to Particular Specification G02: Corrosion Protection

M18.20 DESIGNATION AND INFORMATION PLATES

Each pump shall be supplied with an information plate secured to the pump casing in a visible position indelibly marked with the following details:-

- Maker's name, pump type and serial number
- Year of manufacture
- Rated duty of pump in litres per second
- Head in metres at rated duty
- Pump speed in r/min
- Mass of completely assembled pump in kilogram

M18.21 INTERCHANGEABILITY

Where two or more similar pump units are required, these units will be identical in all respects.

All similar parts of items supplied will be interchangeable without any additional machining or fitting.

M18.22 RECOMMENDED SPARE PARTS

The Tenderer must submit details of spare parts recommended to be kept in store by the Employer with his Tender.

The detail will include a full description of the parts, part identification, number required, guaranteed delivery time and total price delivered to Site.

M18.23 OPERATION AND MAINTENANCE MANUAL

The Contractor shall hand over to the Engineer four sets of the Operation and Maintenance

Manual compiled for each installation not later than at the time of commissioning of the installation. These manuals are a prerequisite for final take over of the plant.

The Operation and Maintenance Manual will contain the following:

(a) Brief description of the plant and installation.

(b) Concise operating instructions.

(c) Routine maintenance instruction.

(d) Precautionary measures, elementary trouble location, rectifying measures and emergency actions.

(e) Detailed information on equipment.

(f) Lists of spare parts including names and addresses of suppliers.

M18.24 DRAWINGS

The drawings included in the Tender Documents are the Engineer's proposal for the plant layout. Should the Tenderer offer alternative layouts, he shall submit drawings with his Tender inorder for it to be evaluated.

Before the Contractor carries out any work, he will submit detailed working drawings to be approved by the Engineer. Approval of these drawings does not relieve the Contractor from his responsibility for the correctness of the drawings.

M18.25 INSTALLATION

The pump and motor shall be aligned to within ± 0.025 mm full indicator movement on dial gauge, regardless of the coupling type. After the pump and motor feet are tightened down, ad pipework erected and tightened, both angular and parallel alignment shall be checked and recorded at each quarter revolution. These readings shall be submitted to the Engineer and is aprerequisite for handover.

Upon completion, dowel pins shall be fitted to facilitate relocation at any future time.

M18.26 INSPECTION, TESTING AND COMMISSIONING

M18.26.1 Testing by Manufacturer

The Manufacturer will carry out all tests on materials, quality control tests, dimensional checking and routine tests on parts to ensure that the pumps and materials conform to the requirements of the relevant SANS or BS specifications and to this Specification. The Engineer will not necessarily attend these tests but records must be kept and all test results will be made available to the Engineer.

M18.26.2 Witnessed Testing

In addition to the above, a number of performance tests will also be carried out in the testing facility of the supplier before equipment is transported to Site. These tests can be carried out in the workshop of the manufacturer/supplier if it is suitably equipped or another approved test facility.

The Engineer may witness these tests and the Contractor will notify the Engineer two weeks in advance of the date and place at which the equipment may be inspected and tested. When tests and inspections have met the satisfaction of the Engineer a certificate of workshop acceptance will be issued. These certificates are a prerequisite before payment for "Materials on Site" can be passed. The Engineer's acceptance will in no way relief the Manufacturer of any of his obligations to design, manufacture and supply pumps strictly in accordance with the Specification.

Performance tests shall include:-

(a) Hydraulic tests on the pump casing. The test pressure will be equal to 1½ times the maximum working pressure at the delivery end of the pump. The testing will be done with blank flanges bolted onto the flanges. The pressure will be maintained for at least 15 minutes. No sign of sweating, leaking, undue deformation and stressing or defect of any kind will be evident during the test period.

(b) Tests to prove that the rotating parts are dynamically balanced.

(c) Performance tests on pump and driving unit.

(d) NPSH requirements if called for in the Project Specifications.

A performance test shall be carried out in accordance with BS 5316 Part 2 - Class B tests if specified. Unless otherwise stated, the Contractor will be required to conduct the performance test on the combined pump/motor unit.

If a performance test of the pump and its driving unit is not possible at the manufacturer's works, this shall be stated in the Tender with reasons to allow the Engineer opportunity to make alternative proposals.

M18.26.3 Testing by an Independent Facility

The Employer may require that an independent testing facility or institution such as the South African Bureau of Standards carry out performance tests. A separate item for performance testing will be provided in the Schedule of Quantities to allow for this.

M18.26.4 Failure to Pass Performance Test

Should the pump unit fail the performance test, whether performed at the manufacturer's works or at an independent institution, the Engineer shall authorise any amendments to the plant which may be considered necessary to meet the guaranteed quantities within the permissible tolerances laid down in BS 5316 Part 2 - Class B tests and prove with further test that the equipment conform to the Specification.

All costs involved in the re-testing of pump units will be borne by the Contractor.

Should the pump unit fail to pass the test with more than 5% variation on the actual guaranteed figures, the engineer will reject the pump unit and request the Contractor to replace the unit so rejected.

Should the pump until still fail to pass the test, but the actual figures do not vary by more than 5% from the actual guaranteed figures, the Engineer may :-

(a) Request the Contractor to carry out amendments to ensure the compliance of the unitwith the Specification; or

(b) Accept the equipment but impose a penalty for non-compliance on the Contractor. A sum will be calculated based on the additional energy used over the life expectancy of the equipment and this will be deducted from the Contract price for each pump set for every kilowatt by which the gross demand exceeds the guaranteed figure with permissible tolerances.

M18.26.5 Commissioning

On completion of the installation the Contractor will check all items for satisfactory functioning. He will then inform the Engineer of his intension to commission the plant. The Engineer may request control measurements on pump alignment at this stage.

A detailed programme of his proposed commissioning procedures will be submitted not later than two weeks prior to the commissioning date.

After a successful running period of 4 hours (to be witnessed by the Engineer) the Contractorwill hand over the installation to the Employer as well as the Operation and Maintenance Manuals. The Completion Certificate will only be issued after the units have been in successful operation for 14 consecutive days and the acceptance tests successfully completed.

During the first 14 days of operation, the Contractor will rectify any problems with the units on Site within 24 hours of being telephonically notified. During the remainder of the maintenance period, the Contractor will, within 14 days of being notified, commence rectifying any possible problems that the Employer may encounter with the equipment supplied under this Contract.

Should the Contractor fail to meet the above requirements, the Employer may appoint others to undertake the necessary repair work at the Contractor's cost.

M18.26.6 Tests at the Site of the Works

The Engineer may require that site tests are performed to verify performance figures guarantee by the Contractor. Flow rate, total head and power input to the pump/motor units shall be determined, as accurate as Site conditions permit, for one or more points on the pump curves close to the specified duty point. The Contractor shall provide suitable instruments with recent calibration certificates.

Should these measured and calculated quantities differ from those guaranteed by more than the tolerances allowed by BS 5316 Part 1 - re-testing of the unit at any testing facility, or the recalibration of the measuring instruments.

Should the subsequent test results still fall outside the allowable tolerances, Clause M18.28.4 shall apply, and call costs shall be borne by the Contractor. In the event of the subsequent test being successful, costs shall be borne by the Employer.

M18.27 COLOUR CODES

The standard final colour codes for equipment supplied under this Contract shall be in accordance with Particular Specification G01.

M18.28 MEASUREMENT AND PAYMENT

Payment under scheduled items shall be made per complete installation as specified, electrical connections, etc and grouting, etc. Measurement and payment will distinguish between supply / delivery and installation / commissioning of the equipment.

The tendered rates or sums shall cover the cost of design, drawings, manufacture, supply, testingat the manufacturers works, delivery to site, off loading, installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified and also for anything not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and anywork or material required for the proper installation of such equipment) to enable the equipmentto be installed and/or function safely and correctly as specified. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.