

MUNICIPAL TENDER REFERENCE

BID/NC062/03/2023/2023

CONTRACT DOCUMENT

FOR THE

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

PROJECT NO: 35008.00/2023/01

VOLUME 3

(RETURNABLE DOCUMENT)

NOTE:

- The Form of Offer and Acceptance (C1.1) is on page 75-76 of this document (see also Clause F.4.4 on page 10)



CLIENT:

NAMA-KHOI MUNICIPALITY
PO Box 17
SPRINGBOK
8240

Tel.: 027 718 8100
Fax: 027 718 2661



ENGINEER:

BVi Consulting Engineers
P.O.Box 1155
UPINGTON
8800

Tel.: 054 – 337 6600
Fax: 054 – 337 6609

AUGUST 2023

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

GENERAL TENDER INFORMATION

TENDER ADVERTISED	:	Friday, 25 August 2023
ESTIMATED CIDB CONTRACTOR GRADING	:	6CE or Higher
SITE VISIT/CLARIFICATION MEETING	:	11h00 on Wednesday, 6 September 2023 (Compulsory)
VENUE FOR SITE VISIT/CLARIFICATION MEETING	:	THE JUNIOR CLUB VENUE IN NABABEEP
CLOSING DATE	:	Friday, 06 October 2023
CLOSING TIME	:	12h00
CLOSING VENUE	:	NAMA-KHOI MUNICIPALITY 4 Namakwa Street SPRINGBOK 8240

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

TENDER SUMMARY

Tender (Supply of material, Plant and Labour)

1. **Gross Tender Sum (Incl. VAT):** R.....
2. **Construction Period:**(weeks)

Name of Tenderer:

Address:

SIGNATURE OF TENDERER

DATE

NAMA-KHOI MUNICIPALITY

DATE

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

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Part T1: Tendering procedures

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**NAMA-KHOI MUNICIPALITY
BID/NC062/03/2023/2023**

**PROJECT NO.35008.00/2023/01
REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS**

Tender Notice and Invitation to Tender

NAMA-KHOI MUNICIPALITY invites tenders for Tender No. **NC062/03/2023/2023: REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS**

The contract entails the following:

- Construction of a New Archimedes Screw Pump Station
- Construction of a New Inlet Works c/w Grit Channels and Flume
- Replacement of existing Electrical Switchgear and Transformers
- Refurbishment of Existing Concrete Structures.
- Refurbishment of existing Mechanical equipment.
- Refurbishment of existing Pipeworks

It is estimated that tenderers should have a CIDB contractor grading designation of **6 CE or higher**. Mechanical subcontractors to have a CIDB grading of at least 4ME.

Documents can be obtained from e-tender or may be collected from the Supply Chain Department at Nama-Khoi Municipality after paying a non-refundable deposit of **R576.05** per document at the cashiers. Queries relating to the issue of these documents may be addressed to the Supply Chain Department from Nama-Khoi Municipality.

A Compulsory site visit/clarification meeting with representatives of the Employer/Engineer will take place at The Junior Club Venue in Nababeep on **Wednesday 6th September 2023 starting at 11h00**.

Sealed tenders and drawings appropriately marked with the contract number and name of the project, must be deposited in the tender box of NAMA-KHOI MUNICIPALITY, 4 Namakwa Street, SPRINGBOK, before **Friday, 6th October 2023 at 12h00**, whereafter the tenders will be opened in public.

Facsimile, e-mail and late tenders will not be accepted.

The Municipality reserves the right not to award the tender to the only or the lowest Tenderer. Tenders may only be submitted on the tender documentation that has been issued.

No tender offer will be considered from the following tenderers:

- a) The tenderers must comply to the CIDB-Grading Conditions.
- b) Persons who were convicted for fraud or corruption during the past five years.
- c) Who wilfully neglected, reneged on, or failed to comply with, a government contract during the past five years.
- d) Tenderer who cannot submit a pin issued by SARS.
- e) Tenderer who is not registered or accredited as a supplier or a contractor according to the Central Supplier Database (CSD).
- f) Proof cannot be provided that a performance guarantee can be submitted on the award of the contract.



Mr. GH Meiring
BVi Consulting Engineers
P.O Box 1155
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Tel.: 054 – 337 6600



Mr Q Titus
NAMA-KHOI MUNICIPALITY
PO Box 17
SPRINGBOK
8240
Tel.: 027 718 8100



NAMA-KHOI MUNICIPALITY

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

LOCALITY PLAN

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

T1.2 Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in Annex F of Board Notice 12 of 2009 in Government Gazette No. 31823 of 30 January 2009, Construction Industry Development Board (CIDB) Standard for Uniformity in Construction Procurement. (See www.cidb.org.za) which are reproduced without amendment or alteration for the convenience of tenderers as an Annex to this Tender Data.

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

The following variations, amendments and additions to the Standard Conditions of Tender as set out in the Tender Data below shall apply to this tender:

Clause Number	Tender Data
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F.1	General
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F.1.1	Actions
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Add the following:

The Employer is **NAMA-KHOI MUNICIPALITY** represented by the MUNICIPAL MANAGER:
Mr. J Swartz

F.1.2	Tender Documents
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Add the following:

"The following documents form part of this tender:

VOLUME 1 : The General Conditions of Contract for Construction Works (3rd Edition 2015) prepared by the South African Institution of Civil Engineering (SAICE) shall apply to, and form the General Conditions of Contract for this contract. Copies of these conditions of contract are obtainable from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, and Tel:(011)8055947, Fax:(011)8055971, e-mail: civilinfo@saice.org.za.

VOLUME 2 : The SANS Standardised Specifications for Civil Engineering Construction prepared by Standards South Africa. These publications are obtainable and tenderers must obtain copies at their own cost from Standards South Africa, Private Bag X191, PRETORIA, 0001.

Volumes 1 and 2 may also be inspected, by appointment, at the offices of the Employer's Agent during normal office hours.

The contract documents issued by the Employer comprise:

VOLUME 3: The Contract Document (this document), in which is bound:

The Tender

Part T1: Tendering procedures

T1.1 Tender notice and invitation to tender

T1.2 Tender data

Part T2 : Returnable Documents

T2.1 List of returnable documents

T2.2 Returnable schedules

The Contract

Part C1: Agreements and Contract Data

C1.1 Form of offer and acceptance

C1.2 Contract data

C1.3 Form of Guarantee

C1.4 Occupational Health and Safety Agreement

C1.5 Contract of Temporary Employment as Community Liaison Officer

Part C2: Pricing Data

C2.1 Pricing Assumptions

C2.2 Bills of Quantities

C2.3 Declaration

Part C3: Scope of Work

C3.1 Description of the Works

C3.2 Engineering

C3.3 Procurement

C3.4 Construction

C3.5 Management

C3.6 Annexes

Part C4 : Site information

C4 Site information

Volume 3 is deemed the "Returnable Documents" which must be returned to the Employer in terms of submitting a tender offer.

F.1.4 Communication and employer's agent

Add the following:

Attention is drawn to the fact that verbal information, given by the Employer's Agent during site visits/clarification meetings or at any other time prior to the award of the Contract, will not be regarded as binding on the Employer. Only information issued formally by the Employer in writing to tenderers will be regarded as amending the Tender Documents.

The Employer's Agent is: BVi Consulting Engineers NC (Pty) Ltd

Name: **Mr GH Meiring**

Address: 55 Bult Street
UPINGTON
8800

Tel: 054 – 337 6600

Fax: 054 – 337 6609

E-Mail : gertm@bvinc.co.za

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

Add the following:

F.1.5.3 The Employer may reject a tender if, in the opinion of the Employer, the tenderer will be unable to achieve the contract participation goal tendered, in the performance of the contract.

F.1.6.2 Competitive negotiation procedure

Add the following to F.1.6.2

A competitive negotiation procedure will not be followed.

F.1.6.3 Proposal procedure using the two-stage system

Add the following to F.1.6.3

A two-stage system will not be followed.

F.2 Tenderer's obligations

F.2.1 Eligibility

Add the following to F.2.1.1:

F.2.1.1 Only those tenderers who satisfy the following criteria are eligible to submit tenders:

F.2.1.1.2 Construction Industry Development Board (CIDB) Registration

Only those tenderers who are registered with the CIDB, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered, or a value determined in accordance with Regulation 25 (1B) or 25 (7A) of the Construction Industry Development Regulations, for a CE class of construction work, are eligible to have their tenders evaluated

Tenderers who are capable of being so registered prior to the evaluation of submissions may be evaluated at the sole discretion of the Employer.

Joint Ventures are eligible to submit tenders provided that:

1. every member of the joint venture is registered with the CIDB;
2. the lead partner has a contractor grading designation in the CE class of construction work;
3. the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a CE class of construction work or a value determined in accordance with Regulation 25 (1B) or 25 (7A) of the Construction Industry Development Regulations.

For alpha-numerics associated with the contractor Grading Designations see Annex G attached.

F.2.7 Site Visit and Clarification meeting

Add the following:

Tenderers should be represented at the site visit/clarification meeting by a person who is suitably qualified and experienced to comprehend the implications of the work involved.

The arrangements for the clarification meeting and site inspection are as follows:

Location / venue: **THE JUNIOR CLUB VENUE, NABABEEP**

Date: **Wednesday, 6th September 2023; Time: 11h00**

Tenderers must sign the attendance register in the name of the tendering entity. Addenda will be issued to, and tenders will be received only from tendering entities appearing on the attendance register.

F.2.12 Alternative tender offers

Add the following to F.2.12.1:

F.2.12.1 If a tenderer wishes to submit an alternative tender offer, he shall do so as separate complete offer on a separate complete set of tender documents clearly marked as an "Alternative Tender" in order to distinguish it from the unqualified tender. The only criterion permitted for such alternative tender offer is that it demonstrably satisfies the Employer's standard and requirements, the details of which may be obtained from the Employer's Agent.

Calculations, drawings and all other pertinent technical information and characteristics as well as modified or proposed Pricing Data must be submitted with the alternative tender offer to enable the Employer to evaluate the efficacy of the alternative and its principal elements, to take a view on the degree to which the alternative complies with the Employer's standards and requirements and to evaluate the acceptability of the pricing proposals. Calculations must be set out in a clear and logical sequence and must clearly reflect all design assumptions. Pricing Data must reflect all assumptions in the development of the pricing proposal.

Acceptance of an alternative tender offer will mean acceptance in principle of the offer. It will be an obligation of the contract for the tenderer, in the event that the alternative is accepted, to accept full responsibility and liability that the alternative offer complies in all respects with the Employer's standards and requirements.

The modified Pricing Data must include an amount equal to 5% of the full amount tendered for the alternative portion of the offer to cover the Employer's costs in confirming the acceptability of the detailed design before it is constructed.

F.2.13 Submitting a tender offer

Add the following to F.2.13.1

F.2.13.1 Where the tendering entity is a joint venture it is recommended that the standard CIDB Joint Venture Agreement be used.

Add the following to F.2.13.3

F.2.13.3 Parts of each tender offer communicated on paper shall be submitted as an original, plus 0 (nought) copies.

Add the following after the first sentence of F.2.13.4:

F.2.13.4 The tender shall be signed by a person duly authorised to do so. Tenders submitted by joint ventures of two or more firms shall be accompanied by the document of formation of the joint venture, authenticated by a notary public or other official deputed to witness sworn statements, in which is defined precisely the conditions under which the joint venture will function, its period of duration, the persons authorised to represent and obligate it, the participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning.

Add the following to F.2.13.5:

F.2.13.5 The Employer's address for delivery of tender offers and identification details to be shown on each tender offer package are:

Location of tender box: NAMA-KHOI MUNICIPALITY, SPRINGBOK

Physical address: 4 Namakwa Street, SPRINGBOK, 8240

Identification details: Tender number NC062/03/2023/2023

Title of tender: REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

Sealed tenders with the Tenderer's name and address and the endorsement "**TENDER NO. NC062/03/2023/2023: "REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS"**" on the envelope, must be placed in the appropriate official tender box at the abovementioned address.

Add the following to F.2.13.6:

F.2.13.6 A two-envelope procedure will **not** be followed (Read with F.3.5).

Add the following sub-clause after F.2.13.9:

F.2.13.10 By signing the offer part of C1.1 Form of Offer and Acceptance the tenderer declares that all information provided in the tender submission is true and correct.

F.2.15 Closing time

Add the following to F.2.15.1:

F.2.15.1 The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender.

Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.

F.2.16 Tender offer validity

Add the following to F.2.16.1:

F.2.16.1 The tender offer validity period is **(90 days)**.

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

Add the following to F.2.17:

A tender will be rejected as non-responsive if the tenderer fails to provide any clarification requested by the employer within the time for submission stated in the employer's written request for such clarification. A tender will also be rejected as non-responsive if the tenderer fails, within the time stated in writing by the Employer, to comply with the requirements of F.4.4.

F.2.18 **Provide other material**

Add the following to F.2.18.1:

F.2.18.1 Provide, on written request by the Employer, where the tendered amount inclusive of VAT **exceeds R 50 million:**

- i) **audited annual financial statement for 3 years**, or for the period since establishment if established during the last 3 years, if required by law to prepare annual financial statements for auditing;
- ii) a certificate signed by the tenderer certifying that the tenderer has no undisputed commitments for municipal services towards a municipality or other service provider in respect of which payment is overdue for more than 30 days;
- iii) particulars of any contracts awarded to the tenderer by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract;
- iv) **a statement indicating whether any portion of the goods or services are expected to be sourced from outside the Republic**, and, if so, what portion and whether any portion of payment from the municipality or municipal entity is expected to be transferred out of the Republic.

Each party to a Consortium/Joint Venture shall submit separate certificates/statements in the above regard.

F.2.23 **Certificates**

Add the following:

The tenderer is required to submit the following:

The tenderer shall submit with his tender:

- (1) either a **Certificate of Contractor Registration** issued by the Construction Industry Development Board or a copy of the application Form for registration in terms of the Construction Industry Development Board Act (Form F006);
- (2) an original valid **Tax Clearance Certificate** issued by the South African Revenue Services or a pin issued by South African Revenue Services.
- (3) Company / CC / Trust / Partnership registration certificates
- (4) Joint Venture Agreement and Power of attorney in case of Joint Ventures
- (5) ID certificates in case of one-man concerns
- (6) Workmen's Compensation Registration Certificate (or proof of payment of contributions in terms of the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993)
- (7) Unemployment Insurance Fund (UIF) Registration Certificate

Each party to a Consortium/Joint Venture shall submit separate certificates in the above regard.

F.3 The Employer's undertakings

F.3.2 Issue Addenda

Add the following to F.3.2:

Notwithstanding any requests for confirmation of receipt of Addenda issued, the tenderer shall be deemed to have received such addenda if the employer can show proof of transmission thereof (or a notice in respect thereof) via electronic mail, facsimile or registered post.

F.3.4 Opening of tender submissions

Add the following to F.3.4.1:

F.3.4.1 The time and location for opening of the tender offers is:

Time: Tenders will be opened immediately after the closing time for receipt of tenders as stated in the Tender Notice and Invitation to Tender, or as stated in any Addendum extending the closing date.
Location: 4 Namakwa Street, SPRINGBOK, 8240

F.3.8 Test for responsiveness

Add the following:

Tenders will be considered non-responsive if, inter alia:

- the tender is not in compliance with the Scope of Work;
- the tenderer does not comply with the CIDB contractor grading designation specified in F.2.1.1.2 above;
- the tenderer has failed to clarify or submit any supporting documentation within the time for submission stated in the employers written request;

F.3.11 Evaluation of tender offers

The method for evaluation for this contract will be the following:

F.3.11.1 Method 2: *Financial offer and preferences*

The procedure for the evaluation of responsive tenders is Method 2 and is described in detail in the Preferential Procurement Specifications

Add the following new subclause:

F.3.11.10 Risk Analysis

Notwithstanding compliance with regard to CIDB registration or any other requirements of the tender, the employer will perform a risk analysis in respect of the following:

- a) reasonableness of the financial offer
- b) reasonableness of unit rates and prices
- c) the tenderers ability to fulfil its obligations in terms of the tender document, that is, that the tenderer can demonstrate that he/she possesses the necessary professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience, reputation, personnel to perform the contract, etc.

No tenderer will be recommended for an award unless the tenderer has demonstrated that he/she has the resources and skills required.

F.3.13 Acceptance of tender offer

Add the following to F.3.13.1:

F.3.13.1 Tender offers will only be accepted if:

- a) the tenderer is registered and in good standing with the South African Revenue Service (SARS) and has submitted evidence in the form of an **original** valid Tax Clearance Certificate issued by SARS or proof that he or she has made arrangements with SARS to meet his or her outstanding tax obligations;

- b) the tenderer or any of its directors is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector;
- c) the tenderer has not:
 - i) abused the Employer's Supply Chain Management System; or
 - ii) failed to perform on any previous contract and has been given a written notice to this effect;
- d) the tenderer has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process.

F.3.18 Provide copies of the contract

Add the following:

The number of paper copies of the signed contract to be provided by the Employer is: **1 (one)**.

F.4 Additional Conditions of Tender

The additional conditions of tender are:

F.4.1 Compliance with Occupational Health and Safety Act 1993

Tenderers are to note the requirements of the Occupational Health and Safety Act No. 85 of 1993 and the Construction Regulations 2003 issued in terms of Section 43 of the Act. The tenderer shall be deemed to have read and fully understood the requirements of the above Act and Regulations and to have allowed for all costs in compliance therewith.

In this regard the Tenderer shall submit with his tender, appended to Schedule 11: Health and Safety Plan in T2.2: Returnable Schedules, a detailed Health and Safety Plan in respect of the Works in order to demonstrate the necessary competencies and resources to perform the construction work all in accordance with the Act and Regulations. Such Health and Safety Plan shall cover inter-alia the following details:

- (1) Management Structure, Site Supervision and Responsible Persons including a succession plan.
- (2) Contractor's induction training programme for employees, sub-contractors and visitors to the Site.
- (3) Health and safety precautions and procedures to be adhered to in order to ensure compliance with the Act, Regulations and Safety Specifications.
- (4) Regular monitoring procedures to be performed.
- (5) Regular liaison, consultation and review meetings with all parties.
- (6) Site security, welfare facilities and first aid.
- (7) Site rules and fire and emergency procedures.

Tenderers are to note that the Contractor is required to ensure that all sub-contractors or others engaged in the performance of the contract also comply with the above requirements.

The Contractor shall prepare and maintain a Health and Safety File in respect of the project, which shall be available for inspection on Site at all times and handed over to the Employer on Final Completion of the project.

The Contractor is required to submit to the Employer the Occupational Health and Safety Agreement (included in C1.4 of the Contract Document) and a letter of good standing from the Compensation Commissioner, or a licensed compensation insurer, within 14 days after the Commencement Date of the contract.

F.4.2 Claims arising after submission of tender

No claim for any extras arising out of any doubt or obscurity as to the true intent and meaning of anything shown on the Contract Drawings or contained in the Conditions of Contract, Scope of Work and Pricing Data, will be admitted by the Employer/Employer's Agent after the submission of any tender and the Tenderer shall be deemed to have:

- 1) inspected the Contract Drawings and read and fully understood the Conditions of Contract.

- 2) read and fully understood the whole text of the Scope of Work and Pricing Data and thoroughly acquainted himself with the nature of the works proposed and generally of all matters which may influence the Contract.
- 3) visited the site of the proposed works, carefully examined existing conditions, the means of access to the site, the conditions under which the work is to be done, and acquainted himself with any limitations or restrictions that may be imposed by the Municipal or other Authorities in regard to access and transport of materials, plant and equipment to and from the site and made the necessary provisions for any additional costs involved thereby.
- 4) requested the Employer or his duly authorised agent to make clear the actual requirements of anything shown on the Contract Drawings or anything contained in the Scope of Work and Pricing Data, the exact meaning or interpretation of which is not clearly intelligible to the Tenderer.

Before submission of any tender, the Tenderer should check the number of pages, and if any are found to be missing or duplicated, or the figures or writing indistinct, or if the Pricing Data contain any obvious errors, the tenderer must apply to the Employer/Employer's Agent at once to have the same rectified, as no liability will be admitted by the Employer/Employer's Agent in respect of errors in any tender due to the foregoing.

- 5) received any Addenda to the tender documents which have been issued in accordance with the Employer's Supply Chain Management Policy.

F.4.3 Imbalance in tendered rates

In the event of tendered rates or lump sums being declared by the Employer to be unacceptable to it because they are either excessively low or high or not in proper balance with other rates or lump sums, the Tenderer may be required to produce evidence and advance arguments in support of the tendered rates or lump sums objected to. If, after submission of such evidence and any further evidence requested, the Employer is still not satisfied with the tendered rates or lump sums objected to, it may request the tenderer to amend these rates and lump sums along the lines indicated by it.

The Tenderer will then have the option to alter and/or amend the rates and lump sums objected to and such other related amounts as are agreed on by the Employer, but this shall be done without altering the tender offer as tendered or, if applicable, the corrected total of prices in accordance with F.3.9.3.

Should the Tenderer fail to amend his Tender in a manner acceptable to the Employer, the Employer may reject the Tender.

F.4.4 Invalid tenders

Tenders shall be considered invalid and shall be endorsed and recorded as such in the tender opening record, by the responsible official who opened the tender, in the following circumstances:

- a) if the tender offer (the tender price/amount) is not submitted on the Form of Offer and Acceptance bound into this tender document (form C1.1, Part C1: Agreements and Contract Data);
- b) if the tender is not completed in non-erasable ink;
- c) if the Form of Offer and Acceptance has not been signed;
- d) if the Form of Offer and Acceptance is signed, but the name of the tenderer is not stated or is indecipherable.

F.4.5 Negotiations with preferred tenderers

The Employer may negotiate the final terms of a contract with tenderers identified through a competitive tendering process as preferred tenderer provided that such negotiation:

- a) does not allow any preferred tenderer a second or unfair opportunity;
- b) is not to the detriment of any other tenderer; and
- c) does not lead to a higher price than the tender as submitted.

Minutes of any such negotiations shall be kept for record purposes.

F.4.6 UIF payments

The Tenderer shall submit to Council a letter from the Industrial Council indicating his good standing with regard to UIF payments upon being requested to do so.

F.4.7 Price variations

The Contract Price shall not be subject to any contract price adjustment, the rates and prices tendered in the bills of quantities shall be final and binding throughout the period of the contract. However, **price adjustments for variations in the costs of special materials may be applicable** where the Employer/Employer's Agent specifies such materials and the relevant information in the Contract Data.

Notwithstanding the above, if, as a result of any extension of time granted, the duration of the contract period exceeds one year, the contract will automatically be subject to contract price adjustment for that period by which the extended contract period exceeds such one year.

F.4.8 Requests for contract documents, or parts thereof, in electronic format

The Employer shall not formally issue tender documents in electronic format as contemplated in F.2.13.2 and F.2.13.3 and shall only issue tender documents in hardcopy. An electronic version of the issued tender documents may be made available to the tenderer, upon written request in terms of this clause, subject to the following:

- (a) Electronic copies of the contract document, or parts thereof, will only be provided to tenderers who have been issued with the tender documents as contemplated in F.1.2 in hardcopy.
- (b) The electronic version shall not be regarded as a substitute for the issued tender documents.
- (c) The Employer shall not accept tenders submitted in electronic format. Tenderers may not complete and submit a printed copy of the electronic version of the tender document or part thereof. Only those tenders that have been completed on the issued hard copy tender document shall be considered.
- (d) The Employer accepts no responsibility or liability arising from any reliance on or use of the electronic version provided in terms of this clause. The Employer further does not guarantee that the electronic version corresponds with the issued tender documents in all respects. Tenderers are alerted to the fact that electronic versions of the tender documents may not reflect any notices or addenda that amend the tender document.
- (e) Any non-compliance with these provisions, including effecting any unauthorised alterations to the tender document as contemplated in F.2.11, shall render the tender invalid. The Employer reserves the right to take any action against such tenderer allowed in law including, in circumstances where the tender had already been awarded, the right to cancel the contract.
- (f) In requesting the electronic version of the tender document or parts thereof, the tenderer is deemed to have read, understood and accepted all of the above conditions.

F.4.9 Tenders forwarded by post

No tenders will be accepted that was posted or faxed.

F.4.10 Withdrawal of Tenders

A Tenderer may withdraw his Tender (in writing) any time before the closing date and time for the submission of tenders if a notice to this effect reaches the Engineer before the closing date and time.

F.4.11 Acceptance or rejection of Tenders

A Tender can be rejected if it is conditional or incomplete or if the Form of Tender or Bill of Quantities contain any absurdities or if the prices in the Bill of Quantities are unbalanced and the Tenderer fail to amend it within twenty-four(24) hours after being notified about it.

The Employer does not bind itself to accept the tender with the highest preference points, the lowest or any tender and reserves the right to accept any tender or portion of a tender, as it deems expedient.

F.4.12 Signing of the Contract

The successful Tenderer has to sign the Form of Agreement within the period of seven (7) days after being notified that his Tender had been accepted.

In the event where the Tenderer fail to take up the Contract when called upon by the Employer to do so, or withdrawing his Tender after the closing date and time, or failing to provide an acceptable

guarantee, the Employer reserves the right to insist that the Tenderer shall pay to the Employer the cost incurred by the Employer in having to award the Tender to another Contractor.

F.4. 13 Amendments of Arithmetical errors

The Employer reserves the right to adjust arithmetical errors in the extension of rates and totals in the tender and the Tenderer will be informed of the effect of any corrections on his tender sum prior to the award of the Contract. In no case will tendered rates be adjusted when correcting such errors.

F.4. 14 Refunding of Deposito's

Deposito's are non-refundable

F.4. 15 Disqualifications of tenders

No tender offer will be considered from the following tenderers:

- a) Persons who were convicted for fraud or corruption during the past five years.
- b) Who wilfully neglected, reneged on or failed to comply with a government contract during the past five years.
- c) Tenderer who cant submit a Tax Clearance Certificate.
- d) Tenderer who is not registered or accredited as a supplier or a contractor.
- e) Proof cant be provided that a performance quarantine can be submitted on the award of the contract.

F.4. 16 Cessions of Rights and Demands

Cession of Rights will not be considered and will therefore not be applicable to the execution of this contract.

F.4. 17 Time for Completion of Works

The period for the completion of works must be stated in the Contract Data of the Tender (in weeks) within which time the work must be completed.

F.4. 18 Currency

All prices, deposito's and payments shall be in the currency of the Republic of South Africa (Rand) and cheques for the deposito's have to be made out to **NAMA-KHOI MUNICIPALITY**.

Annex F

(normative)

Standard Conditions of Tender

F.1 General

F.1.1 Actions

F.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in F.2 and F.3, timorously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

F.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict, and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note: 1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.

2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

F.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

F.1.2 Tender Documents

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

F.1.3 Interpretation

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

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

F.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

- a) **conflict of interest** means any situation in which:
 - i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfil his or her duties impartially;
 - ii) an individual or organisation is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
 - iii) incompatibility or contradictory interests exist between an employee and the organisation which employs that employee.
- b) **comparative offer** means the tenderer's financial offer after all tendered parameters that will affect the value of the financial offer have been taken into consideration in order to enable comparisons to be made between offers on a comparative basis
- c) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process; and
- d) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels
- e) **organization** means a company, firm, enterprise, association or other legal entity, whether incorporated or not, or a public body

- f) **quality (functionality)** means the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.

F.1.4 Communication and employer's agent

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

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

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

F.1.6 Procurement procedures

F.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to F.3.13, be concluded with the tenderer who in terms of F.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

F.1.6.2 Competitive negotiation procedure

F.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of F.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of F.3.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

F.1.6.2.2 All responsive tenderers, or not less than three responsive tenderers that are highest ranked in terms of the evaluation method and evaluation criteria stated in the tender data, shall be invited in each round to enter into competitive negotiations, based on the principle of equal treatment and keeping confidential the proposed solutions and associated information. Notwithstanding the provisions of F.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

F.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to make a fresh tender offer, based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

F.1.6.2.4 The contract shall be awarded in accordance with the provisions of F.3.11 and F.3.13 after tenderers have been requested to submit their best and final offer.

F.1.6.3 Proposal procedure using the two stage-system

F.1.6.3.1 Option 1

Tenderers shall in the first stage submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

F.1.6.3.2 Option 2

F.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

F.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data, and award the contract in terms of these conditions of tender.

F.2 Tenderer's obligations

F.2.1 Eligibility

F.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

F.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

F.2.2 Cost of tendering

Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer comply with requirements.

F.2.3 Check documents

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

F.2.4 Confidentiality and copyright of documents

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

F.2.5 Reference documents

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

F.2.6 Acknowledge addenda

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

F.2.7 Clarification meeting

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

F.2.8 Seek clarification

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

F.2.9 Insurance

Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

F.2.10 Pricing the tender offer

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

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

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

F.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

F.2.11 Alterations to documents

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

F.2.12 Alternative tender offers

F.2.12.1 Unless otherwise stated in the tender data submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted. The alternative tender offer is to be submitted with the main tender offer together with a schedule that compares the requirements of the tender documents with the alternative requirements the tenderer proposes.

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

F.2.13 Submitting a tender offer

F.2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works, services or supply identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

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 legibly in non-erasable ink.

F.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

F.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

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

F.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked "financial proposal" and place the remaining returnable documents in an envelope marked "technical proposal". Each envelope shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

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

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

F.2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

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

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

F.2.15 Closing time

F.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

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

F.2.16 Tender offer validity

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

F.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

F.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted.

F.2.16.4 Where a tender submission is to be substituted, submit a substitute tender in accordance with the requirements of F.2.13 with the packages clearly marked as "SUBSTITUTE".

F.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

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

F.2.18 Provide other material

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

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

F.2.19 Inspections, tests and analysis

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

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

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the conditions of contract identified in the contract data.

F.2.21 Check final draft

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

F.2.22 Return of other tender documents

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

F.2.23 Certificates

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

F.3 The Employer's undertakings

F.3.1 Respond to requests from the tenderer

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

F.3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:

- a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;
- b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
- c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

F.3.2 Issue Addenda

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

F.3.3 Return late tender offers

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

F.3.4 Opening of tender submissions

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

F.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, preferences claimed and time for completion for the main tender offer only.

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

F.3.5 Two-envelope system

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

F.3.5.2 Evaluate the quality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the quality evaluation more than the minimum number of points for quality stated in the tender data, and

announce the score obtained for the technical proposals and the total price and any preferences claimed. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for quality.

F.3.6 Non-disclosure

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

F.3.7 Grounds for rejection and disqualification

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

F.3.8 Test for responsiveness

F.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

- a) Complies with the requirements of these Conditions of Tender,
- b) has been properly and fully completed and signed, and
- c) is responsive to the other requirements of the tender documents.

F.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

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

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

F.3.9 Arithmetical errors, omissions and discrepancies

F.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

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

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

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

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

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

prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

F.3.10 Clarification of a tender offer

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

F.3.11 Evaluation of tender offers

F.3.11.1 General

Appoint an evaluation panel of not less than three persons. Reduce each responsive tender offer to a comparative offer and evaluate them using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

F.3.11.2 Method 1: Financial offer

In the case of a financial offer:

- a) Rank tender offers from the most favourable to the least favourable comparative offer.
- b) Recommend the highest ranked tenderer for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- c) Re-rank all tenderers should there be compelling and justifiable reasons not to recommend the highest ranked tenderer and recommend the highest ranked tenderer, unless there are compelling and justifiable reasons not to do so and the process set out in this subclause is repeated.

F.3.11.3 Method 2: Financial offer and preference

In the case of a financial offer and preferences:

- a) Score each tender in respect of the financial offer made and preferences claimed, if any, in accordance with the provisions of F.3.11.7 and F.3.11.8.
- b) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula:

$$T_E = N_{FO} + N_P$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;
 N_P is the number of tender evaluation points awarded for preferences claimed in accordance with F.3.11.8.

- c) Rank tender offers from the highest number of tender evaluation points to the lowest.
- d) Recommend the tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- e) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points, and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this subclause is repeated.

F.3.11.4 Method 3: Financial offer and quality

In the case of a financial offer and quality:

- a) Score each tender in respect of the financial offer made and the quality offered in accordance with the provisions of F.3.11.7 and F.3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any.
- b) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula:

$$T_E = N_{FO} + N_P$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;
 N_Q is the number of tender evaluation points awarded for quality offered in accordance with F.3.11.9.

- c) Rank tender offers from the highest number of tender evaluation points to the lowest.
- d) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- e) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this subclause is repeated.

F.3.11.5 Method 4: Financial offer, quality and preferences

In the case of a financial offer, quality and preferences:

- a) Score each tender in respect of the financial offer made, preference claimed, if any, and the quality offered in accordance with the provisions of F.3.11.7 to F.3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any.
- b) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula, unless otherwise stated in the Tender Data:

$$T_E = N_{FO} + N_P$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;
 N_P is the number of tender evaluation points awarded for preferences claimed in accordance with F.3.11.8;
 N_Q is the number of tender evaluation points awarded for quality offered in accordance with F.3.11.9.

- c) Rank tender offers from the highest number of tender evaluation points to the lowest.
- d) Recommend the tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- e) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this subclause is repeated.

F.3.11.6 Decimal places

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

F.3.11.7 Scoring Financial Offers

Score the financial offers of remaining responsive tender offers using the following formula:

$$N_{FO} = W_1 \times A$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer.
 W_1 is the maximum possible number of tender evaluation points awarded for the financial offer as stated in the Tender Data.
 A is a number calculated using the formula and option described in Table F.I as stated in the Tender Data.

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

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

F.3.11.8 Scoring preferences

Confirm that tenderers are eligible for the preferences claimed in accordance with the provisions of the tender data and reject all claims for preferences where tenderers are not eligible for such preferences.

Calculate the total number of tender evaluation points for preferences claimed in accordance with the provisions of the tender data.

F.3.11.9 Scoring quality

Score each of the criteria and sub criteria for quality in accordance with the provisions of the Tender Data.

Calculate the total number of tender evaluation points for quality using the following formula:

$$N_Q = W_2 \times S_O / M_S$$

where: S_O is the score for quality allocated to the submission under consideration;
 M_S is the maximum possible score for quality in respect of a submission; and
 W_2 is the maximum possible number of tender evaluation points awarded for the quality as stated in the tender data.

The procedure for the evaluation of responsive tenders is Method 4 (Financial offer, quality and preference) The total number of tender evaluation points (T_{EV}) shall be determined in accordance with the following formula.

$$T_{EV} = f_1 (N_{FO} + N_P) + f_2 N_Q$$

$$T_{EV} = \text{Total number of tender evaluation points.}$$

where f_1 and f_2 are fractions, f_1 equals 1 minus f_2 and f_2 equals 0.25

N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with 5.11.7 in SANS 10845-3, 2015 where the score for financial offer is calculated using the following formula,

$$N_{FO} = W_1 A,$$

Where maximum point for $W_1 = 90$

$$A = [1 - \{(P - P_m)/P_m\}]$$

N_P is the number of tender evaluation points awarded for preferences claimed in accordance with the Nama Khoi Preferential Procurement Policy, 2023 Schedule.

N_Q is the number of tender evaluation points awarded for quality offered in accordance with 5.11.9 in SANS 10845-3,2015, where maximum points for qualifications is 100.

For eligibility refer to Notice and Invitation to Tender T1.1

Quality(Functionality) criteria, points and evaluation

Tenderers are required to demonstrate their ability to undertake the work and provide proof of **experience, expertise, personnel, plant and equipment** to undertake work of this nature.

Tender offers that fail to score the minimum number of points for functionality will be rejected.

The onus rests with the tenderer to supply sufficient information to allow for the proper scoring, evaluation and award of points.

Where insufficient information is provided, zero points will be awarded for such particular criterion.

Description of Quality/ functionality criterion	Maximum number of points
1. Availability/Commitment of Resources and Equipment	25
2. Expertise of Key personnel (CV's and Certificates) as per list of returnable schedules.	25
3. Track record of Previous similar related projects	25
4. Quality Assurance systems which ensure compliance.	25
Maximum possible score for quality (M_s)	100

The minimum score for quality is 70 points. Tenderers that fail to achieve the minimum score for quality will be *rejected*. *Tenderers to be informed, Only the successful tenderer will be contacted.*

Criteria 1. Availability/commitment of Resources and Equipment

Tenderers must indicate what resources (human and otherwise) they have available and intend allocating to this project and on what basis (this is, for what aspect of the work and whether full or part time), if successful. This must include the key personnel, plus others (for example, **Pipe Construction specialist, Concrete Works specialist, Quantity Surveyors**) and site supervisory staff such as the **Contract Manager and the Site Agent**.

An intended **resource allocation schedule must be appended to Schedule 25**, Part T2.2.: Returnable schedules. Tenders should note that, during the course of this tender, any personnel listed at tender stage may only be replaced with personnel of similar qualification and experience, subject to the approval of the employer's agent.

More resources (human and Equipment etc.) available within the contractor's and subcontractor's portfolio, including a detailed description of responsibilities will be convincing.

Rating	Scoring	Evaluation indicators
Very Good	25	The tenderer has convincingly illustrated that extensive organizational, logistics and support resources will be available for the execution of the project.
Good	20	The tender has convincingly illustrated that sufficient organizational, logistic and support resources will be available for the execution of the project.
Satisfactory	10	The tenderer reasonably illustrates that suitable organizational, logistics, and support resources will be available for execution of the project.
Poor	5	The tenderer fails to illustrate that sufficient organizational logistic and support resources will be available for the project.

Criteria 2. Expertise of Key personnel (CV's and Certificates) as per list of returnable schedules.

As the work required in terms of this tender is considered to be of a moderate to high technical complexity, but nevertheless requires an appropriate level of expertise. It's essential that suitably qualified and experience personnel be assigned to this project. Besides the minimum requirements specified in the eligibility criteria, it would be advantageous if the key personnel can demonstrate recent experience related to similar projects, namely the construction of pipe lines, construction of concrete works, etc.

Aside from submitting a general CV for each key personnel, tenderers must submit a statement for each of the key personnel which **highlights particular fields of specialization and experience** that is relevant to this particular project.

The ECSA registration and/or SACPCMP registration numbers should be provided. These statements must be appended to **Schedule 10**, Part T2.2: Returnable Schedules with required CV's. All certificates must be certified within 3 months of this tender.

Rating	Scoring	Evaluation indicators
Very Good	25	The tenderer must demonstrate that key staff are exceptionally qualified (over 15 years of registered experience) and have the necessary competence to deliver the objectives of the project. Staff proposed should cover the entire scope of the project.(>15 years' experience on pipeline projects and concrete construction)
Good	20	The tenderer must demonstrate that key staff are adequately qualified (10 to 15 years of registered experience) and competent in application of their skill to meet the objectives of the project. .(10 - 15 years experience on pipeline and concrete works projects)
Satisfactory	10	The tenderer must demonstrate that key staff are reasonably qualified (5 to 7 years registered experience) and competent in application of their skill to meet the objectives of the project.
Poor	5	The tenderer fails to demonstrate that key staff are adequately qualified and competent to meet the objectives of the project.

Criteria 3. Track record of Previous similar related projects

Tenderers must complete **Schedule 4**, Part T2.2.: Returnable Schedules. Two lists to be provided, namely **Wastewater Treatment Plant projects, inclusive of Pipe works and Concrete Works, Project management with multi-disciplinary specialist sub-contractors** and other similar projects (construction of pipe works and water retaining concrete works) which have been successfully completed in the past five years.

Rating	Scoring	Evaluation indicators
Very Good	25	The tenderer has more than 7 projects on lists provided. E.g., 3 similar projects to Wastewater Treatment Plants, pipelines, concrete works, project management multi-disciplinary projects and 4 additional projects of similar value.
Good	20	The tenderer has 5 projects on lists provided . E.g., 2 similar projects to Wastewater Treatment Plants, pipelines, concrete works, project management of multi-disciplinary projects and 3 additional projects of similar value.
Satisfactory	10	The tenderer has 3 projects on lists provided . E.g., 1 similar project to Wastewater Treatment Plants, pipelines, concrete works, project management multi-disciplinary projects and 2 additional projects of similar value.
Poor	5	The tenderer has 1 project on lists provided . E.g., 1 similar project to Wastewater Treatment Plants, pipelines, project management of multi-disciplinary and zero projects of similar value.

Criteria 4. Quality Assurance system which ensures compliance

The tender should demonstrate that they have a proper Quality Assurance system in place to guarantee the quality of work output. The QA system should meet SA standards and should be detailed and appended to this tender document.

The ISO 9001: 2015 Quality Management certification is the benchmark.

If an in-house QMS system is employed, a comprehensive summary of it should be appended as proof.

Attachment Title: Quality Assurance

Please include a brief approach and methodology within your Quality Assurance plan.

Rating	Scoring	Evaluation indicators
Very Good	25	The tenderer has a recognized Quality Assurance System such as ISO9001-2015 and has demonstrated that the QA System shall be compatible with the QA requirements for bulk water infrastructure. (<i>Under Attachment : Quality Assurance</i>)
Good	20	Tender has a comprehensive in-house QA System that meets project QA requirements for bulk water infrastructure. (<i>Under Attachment: Quality Assurance</i>).
Satisfactory	10	Tender only has a suitable QA system which is partially suitable for the Project Scope (eg. for pipelines, but not for concrete works)
Poor	5	Tenderers' Quality Assurance does not meet Project QA requirements.

F.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and/or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

F.3.13 Acceptance of tender offer

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

- is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
- can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
- has the legal capacity to enter into the contract,
- is not insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,
- complies with the legal requirements, if any, stated in the tender data, and
- is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

F.3.14 Prepare contract documents

F.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:

- a) addenda issued during the tender period,
- b) inclusion of some of the returnable documents,
- c) other revisions agreed between the employer and the successful tenderer.

F.3.14.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

F.3.15 Complete adjudicator's contract

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

F.3.16 Notice to unsuccessful tenderers

F.3.16.1 Notify the successful tenderer of the employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the tender data, or agreed additional period.

F.3.16.2 After the successful tenderer has been notified of the employer's acceptance of the tender, notify other tenderers that their tender offers have not been accepted.

F.3.17 Provide copies of the contracts

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

F.3.18 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender, but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

Annex G
(normative)

Alpha-numerics associated with the Contractor Grading Designations

Table G1: Contractor grading designations and associated parameters

Contractor Grading Designation	Tender Value Range designation	Maximum value of contract that a contractor is considered capable of performing (R)
2 (class of construction works)	2	1 000 000
3 (class of construction works)	3	3 000 000
4 (class of construction works)	4	6 000 000
5 (class of construction works)	5	10 000 000
6 (class of construction works)	6	20 000 000
7 (class of construction works)	7	60 000 000
8 (class of construction works)	8	200 000 000
9 (class of construction works)	9	No Limit

Table G2: Classes of construction work (see next page)

Table G2 **CLASSES OF CONSTRUCTION WORK**

Description	Designation	Definition	Works types	Examples
Civil engineering works	CE	Construction works that are primarily concerned with materials such as steel, concrete, earth and rock and their application in the development, extension, installation, maintenance, removal, renovation, alteration, or dismantling of building and engineering infrastructure	Water, sewerage, roads, railways, harbours and transport, urban development and municipal services	Structures such as a cooling tower, bridge, culvert, dam, grand stand, road, railway, reservoir, runway, swimming pool, silo or tunnel. The results of operations such as dredging, earthworks and geotechnical processes. Township services, water treatment and supply, sewerage works, sanitation, soil conservation works, irrigation works, storm-water and drainage works, coastal works, ports, harbours, airports and pipelines.
Electrical engineering works (Infrastructure)	EP	Construction works that are primarily concerned with development, extension, installation, removal, renovation, alteration or dismantling of engineering infrastructure: a) relating to the generation, transmission and distribution of electricity; or b) which cannot be classified as EB.	Electrical power generation, transmission, control and distribution equipment and systems.	Power generation Street and area lighting Substations and protection systems Township reticulations Transmission Lines Supervisory control and data acquisition systems
Electrical engineering works (buildings)	EB	Construction works that are primarily concerned with the installation, extension, modification or repair of electrical installations in or on any premises used for the transmission of electricity from a point of control to a point of consumption, including any article forming part of such an installation	All electrical equipment forming an integral and permanent part of buildings and/or structures, including any wiring, cable jointing and laying and electrical overhead line construction	Electrical installations in buildings Electrical reticulations within a plot of land (erf) or building site Standby plant and uninterrupted power supply Verification and certification of electrical installations on premises

Description	Designation	Definition	Works types	Examples
General building works	GB	Construction works that: a) are primarily concerned with the development, extension, installation, renewal, renovation, alteration, or dismantling of a permanent shelter for its occupants or contents; or b) cannot be categorised in terms of the definitions provided for civil engineering works, electrical engineering works, mechanical engineering works, or specialist works.	Buildings and ancillary works other than those categorised as being: a) civil engineering works; b) electrical engineering works; c) mechanical engineering works; or d) specialist works.	Buildings for domestic, industrial, institutional or commercial occupancies Car ports Fences other than classified as SS Stores Walls
Mechanical engineering works	ME	Construction works that are primarily concerned with the development, extension, installation, removal, alteration, renewal of engineering infrastructure for gas transmission and distribution, solid waste disposal, heating, ventilation and cooling, chemical works, metallurgical works, manufacturing, food processing and, materials handling	Machine systems including those relating to the environment of building interiors: a) gas transmission and distribution systems b) pipelines c) solid waste disposal d) materials handling, lifting machinery, heating, ventilation and cooling, pumps, e) continuous process systems f) chemical works, metallurgical works, manufacturing, food processing such as that in concentrator machinery and apparatus, oil and gas wells, smelters, cyanide plants, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the beneficiation of metals, minerals, rocks, petroleum and organic substances or other chemical processes.	Air-conditioning and mechanical ventilation Boiler installations and steam distribution Central heating Centralised hot water generation Cranes and hoists Dust and sawdust extraction Compressed air, gas and vacuum installations Conveyor and materials handling installations Continuous process systems involving chemical works, metallurgical works, oil and gas wells, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the beneficiation of metals, minerals, rocks, petroleum and organic substances and other chemical processes Kitchen equipment Laundry equipment Lift installations and escalators Refrigeration and cold rooms Waste handling systems (including compactors)

Description	Designation	Definition	Works types	Examples
Specialist works	SB	A subset of construction works identified and defined by the Board that involves specialist capabilities for its execution	The extension, installation, repair, maintenance or renewal, or removal, of asphalt	
	SC		The development, extension, installation, removal, and dismantling, as relevant, associated with building excavations, shaft sinking and lateral earth support	
	SD		The development, extension, installation, repair, renewal, removal, or alteration of corrosion protection systems (cathodic, anodic and electrolytic)	
	SE		Demolition of buildings and engineering infrastructure and blasting	
	SF		The development, extension, installation, renewal, removal, renovation, alteration or dismantling of fire prevention and protection infrastructure (drencher and sprinkler systems and fire installation)	
	SG		The development, extension, installation, renewal, removal, renovation, alteration or dismantling of glazing, curtain walls and shop fronts	
	SH		The development, extension, installation, maintenance, renewal, removal, alteration or dismantling, as relevant, of landscaping, irrigation and horticultural works	
	SI		The development, extension, installation, repair, maintenance, renewal, removal, renovation, alteration or dismantling of lifts, escalators, travellers and hoisting machinery	
	SJ		The development, installation, removal, or dismantling, as relevant, of piles and other specialized foundations for buildings and structures	
	SK		The installation, renewal, removal, alteration or dismantling, as relevant, road markings and signage	
	SL		The development, extension, installation, renewal, removal, renovation, alteration or dismantling of structural steelwork and scaffolding	
	SM		Timber buildings and structures	
	SN		The extension, installation, repair, maintenance, renewal, removal, renovation or alteration, as relevant, of the waterproofing of basements, roofs and walls using specialist systems.	
	SO		The development, extension, installation, renewal, removal, alteration or dismantling or demolition of water installations and soil and waste water drainage associated with buildings (wet services, plumbing)	
	SQ		The development, extension, installation, repair, removal, alteration, dismantling or demolition of precast concrete or steel fencing	

Part T2: Returnable Documents

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T2.1 List of Returnable Documents

The tenderer must complete the following Returnable Documents in **black ink**:

1. Returnable Schedules required for tender evaluation purposes

	Pages
1: COMPULSORY ENTERPRISE QUESTIONNAIRE	29 – 30
2: SITE VISIT/CLARIFICATION MEETING CERTIFICATE	31
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21: SCHEDULE: SUPPLY CHAIN MANAGEMENT 1.....	69
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23: CONTRACTOR'S CERTIFICATE OF REGISTRATION WITH CIDB.....	71
24: FORM OF INTENT TO PROVIDE A PERFORMANCE GUARANTEE.....	73
25: RESOURCE COMMITMENT SCHEDULE	74

2. Other documents required for tender evaluation purposes

- Joint Venture Agreement (if applicable) - append to Schedule 3.
- An original valid **Tax Clearance Certificate** issued by the South African Revenue Services -append to Schedule 8.
- All addenda released by the Engineer - append to Schedule 13
- **CIDB Certificate** - append to Schedule 28
- **Letter from Financial Institution or Bank** - append to Schedule 24

3. Returnable Schedules that will be incorporated into the Contract

- HEALTH AND SAFETY PLAN (Schedule 11).....42
- RECORD OF ADDENDA TO TENDER DOCUMENTS (Schedule 13)44
- DAYWORKS SCHEDULE (Schedule 14)45

4. C1.1 The offer portion of the C1.1 Form of Offer and Acceptance

5. C1.2 Contract Data (Part 2)

6. C2.2 Bills/Schedules of Quantities

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T2.2 Returnable Schedules

SCHEDULE 1 : COMPULSORY ENTERPRISE QUESTIONNAIRE

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

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

Section 2: VAT registration number, if any:

Section 3: CIDB registration number, if any:

Section 4: Particulars of sole proprietors and partners in partnerships

Name*	Identity number*	Personal income tax number*

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

Section 5: Particulars of companies and close corporations

Company registration number

Close corporation number

Tax reference number

Section 6: Record of service of the state

Indicate by marking the relevant boxes with a cross, if any sole proprietor, partner in a partnership or Director, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months in the service of any of the following:

- | | |
|---|---|
| <input type="checkbox"/> a member of any municipal council | <input type="checkbox"/> an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999) |
| <input type="checkbox"/> a member of any provincial legislature | <input type="checkbox"/> a member of an accounting authority of any national or provincial public entity |
| <input type="checkbox"/> a member of the National Assembly or the National Council of Provinces | <input type="checkbox"/> an employee of Parliament or a provincial legislature |
| <input type="checkbox"/> a member of the board of Directors of any municipal entity | |
| <input type="checkbox"/> an official of any municipality or municipal entity | |

If any of the above boxes are marked, disclose the following:

Name of sole proprietor, partner, Director, manager, principal shareholder or stakeholder	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		current	Within last 12 months

*insert separate page if necessary

Section 7: Record of spouses, children and parents in the service of the state

Indicate by marking the relevant boxes with a cross, if any spouse, child or parent of a sole proprietor, partner in a partnership or Director, manager, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months been in the service of any of the following:

- | | |
|--|---|
| <input type="checkbox"/> a member of any municipal council | <input type="checkbox"/> an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999) |
| <input type="checkbox"/> a member of any provincial legislature | <input type="checkbox"/> a member of an accounting authority of any national or provincial public entity |
| <input type="checkbox"/> a member of the National Assembly or the National Council of Province | <input type="checkbox"/> an employee of Parliament or a provincial legislature |
| <input type="checkbox"/> a member of the board of Directors of any municipal entity | |
| <input type="checkbox"/> an official of any municipality or municipal entity | |

Name of spouse, child or parent	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		current	Within last 12 months

*insert separate page if necessary

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

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

SIGNED ON BEHALF OF TENDERER:

NAMA-KHOI MUNICIPALITY

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SCHEDULE 2 : SITE VISIT/CLARIFICATION MEETING CERTIFICATE

This is to certify that I/we, _____
of (tenderer) _____
of (address) _____

telephone number _____
fax number _____
on (date) _____

have examined the Site of the Works and its surroundings for which I/we am/are submitting this Tender and have, so far as is practicable, familiarized myself/ourselves with all the information, risks, contingencies and other circumstances which may influence or affect my/our Tender.

SIGNED ON BEHALF OF TENDERER:

SIGNED ON BEHALF OF EMPLOYERS AGENT:

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 3 : CERTIFICATE OF AUTHORITY FOR JOINT VENTURES

This returnable schedule is to be completed by joint ventures.

We, the undersigned, are submitting this tender offer in joint venture and hereby authorize Mr/Ms
....., authorised signatory of the company, close corporation or partnership
....., acting in the capacity of lead partner, to sign all documents in
connection with the tender offer and any contract resulting from it on our behalf.

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

Note :

A copy of the Joint Venture Agreement (Refer to F2.13.1 in Part T1.2) showing clearly the **percentage contribution of each partner** to the Joint Venture shall be appended to this schedule.

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SCHEDULE 4 : SCHEDULE OF WORK EXPERIENCE

The tenderer shall insert in the spaces provided below a list of similar completed contracts awarded to him and those currently being undertaken. Provide contactable references of clients and contracts. **Failure to complete this Schedule may result in the Tender not being considered.**

COMPLETED CONTRACTS OF SIMILAR NATURE AND COMPLEXITY				
EMPLOYER (NAME, TEL No. AND FAX No.)	CONSULTING ENGINEER (NAME, TEL No. AND FAX No.)	NATURE OF WORK	VALUE OF WORK R(m)	DATE COMPLETED

CURRENT CONTRACTS OF SIMILAR VALUE				
EMPLOYER (NAME, TEL No. AND FAX No.)	CONSULTING ENGINEER (NAME, TEL No. AND FAX No.)	NATURE OF WORK	VALUE OF WORK R(m)	ANTICIPATED COMPLETION DATE

Number of sheets, appended by the tenderer to this Schedule (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 5: SCHEDULE OF CONSTRUCTION EQUIPMENT

The tenderer shall state below what construction equipment will be available for this Contract. The tenderer shall differentiate, if applicable, between construction equipment immediately available and construction equipment which will become available by virtue of outstanding orders, and indicate what further construction equipment will be acquired or hired for the work should he be awarded the Contract. **In the case of hiring equipment, proof must be provided that the hiring company will make plant and equipment available to the tenderer should the contract be awarded to the tenderer. Failure to complete this Schedule may result in the Tender not being considered.**

CONSTRUCTION EQUIPMENT IMMEDIATELY AVAILABLE

DESCRIPTION, SIZE, CAPACITY	QTY	YEAR OF MANUFACTURE

CONSTRUCTION EQUIPMENT ON ORDER

(State details of arrangements made, with delivery dates)

DESCRIPTION, SIZE, CAPACITY	QTY	YEAR OF MANUFACTURE

CONSTRUCTION EQUIPMENT THAT WILL BE ACQUIRED OR HIRED

(State details of delivery arrangements)

DESCRIPTION, SIZE, CAPACITY	QTY	YEAR OF MANUFACTURE

Number of sheets, appended by the tenderer to this Schedule (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:

.....

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 6: PRELIMINARY PROGRAMME (FOR INFORMATION PURPOSES ONLY)

The tenderer shall detail below or attach a preliminary programme, to this schedule.

This programme shall be in the form of a bar chart (Gantt chart) or similar acceptable time/activity form reflecting the proposed sequence and tempo of the various activities and the quantities that will be carried out every week under each of the elements, comprising the work for this contract. The programme shall also indicate the point where the tenderer intends to commence work operations and the direction in which the work will proceed. The working hours shall be indicated.

The tenderer shall also take into account the additional requirements stated in the Project Specifications when drawing up the programme.

Details of the preliminary programme shall be appended to this Schedule.

Number of sheets, appended by the tenderer to this Schedule (If nil, enter NIL).

PROGRAMME

ACTIVITY	WEEKS / MONTHS											

[Note: The programme must be based on the completion time as specified in the Contract Data. No other completion time that may be indicated on this programme will be regarded as an alternative offer, unless it is listed in Table (b) of Form H hereafter and supported by a detailed statement to that effect, all as specified in the Tender Data]

SIGNED ON BEHALF OF TENDERER:

.....

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 7: SCHEDULE OF ESTIMATED MONTHLY EXPENDITURE

The tenderer shall state his estimated expenditure indicating the values of each monthly claim in terms of Clause 49 of the General Conditions of Contract, which he estimates will arise based on his preliminary programme and tendered rates, in the table below. The total of the monthly amounts shall be equal to the tender sum.

MONTH	VALUE
1.	R
2.	R
3.	R
4.	R
5.	R
6.	R
7.	R
8.	R
9.	R
SUBTOTAL	R
CONTINGENCIES (10%)	R
SUBTOTAL	R
VAT (14%)	R
TOTAL	R (INCLUDING VAT @ 14%)

SIGNED ON BEHALF OF TENDERER:

.....

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 8: TAX CLEARANCE CERTIFICATE OR PIN ISSUED BY SARS

A. TAX CLEARANCE CERTIFICATE OR ISSUED PIN FROM SARS

An **original** valid Tax Clearance Certificate from the South African Revenue Service (SARS) shall be attached to this Schedule or proof that the tenderer has made arrangements with SARS to meet his or her outstanding tax obligations. Alternatively, the pin issued by SARS must be provided.

Each party to a Consortium/Joint Venture shall submit a separate Tax Clearance Certificate, or proof that he or she has made the necessary arrangements with SARS.

SIGNED ON BEHALF OF TENDERER:

.....

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 10: DETAILS OF CONTRACT MANAGER AND SITE AGENT'S EXPERIENCE

Tenderers shall set out in the Schedule hereunder details of the Site Agent and General Foreman's experience in work of a similar nature to that for which their Tender is submitted. **Provide Contactable references of clients. Failure to complete this Schedule may result in the Tender not being considered.**

CONTRACT MANAGER	NAME:NQF LEVEL.....			
CONTRACT & CLIENT	NATURE OF WORK	POSITION HELD	VALUE OF WORK	YEAR COMPLETED

SITE AGENT	NAME:NQF LEVEL.....			
CONTRACT & CLIENT	NATURE OF WORK	POSITION HELD	VALUE OF WORK	YEAR COMPLETED

Number of sheets, appended by the tenderer to this Schedule (If nil, enter NIL).

SIGNED ON BEHALF OF THE TENDERER:

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 11: HEALTH AND SAFETY PLAN

Tenderers are to note the requirements of the Occupational Health and Safety Act No. 85 of 1993 and the Construction Regulations 2003 issued in terms of Section 43 of the Act. The tenderer shall be deemed to have read and fully understood the requirements of the above Act and Regulations and to have allowed for all costs in compliance therewith.

In this regard the tenderer shall prepare and attach a Health and Safety Plan in respect of the Works in order to demonstrate the necessary competencies and resources to perform the construction work all in accordance with the Act and Regulations. Such Health and Safety Plan shall cover inter-alia the following details:

- (1) Management Structure, Site Supervision and Responsible Persons including a succession plan.
- (2) Contractor's induction training programme for employees, sub-contractors and visitors to the Site.
- (3) Health and safety precautions and procedures to be adhered to in order to ensure compliance with the Act, Regulations and Safety Specifications.
- (4) Regular monitoring procedures to be performed.
- (5) Regular liaison, consultation and review meetings with all parties.
- (6) Site security, welfare facilities and first aid.
- (7) Site rules and fire and emergency procedures.

Tenderers are to note that the Contractor is required to ensure that all sub-contractors or others engaged in the performance of the contract also comply with the above requirements.

The tenderer shall also take into account the additional requirements stated in the Scope of Work when drawing up the Health and Safety Plan for the contract.

Details of the Health and Safety Plan shall be appended to this Schedule.

Number of sheets, appended by the tenderer to this Schedule (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:

.....

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 12: PROPOSED AMENDMENTS AND QUALIFICATIONS BY TENDERER

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

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

If no deviations or modifications are desired, the schedule hereunder is to be marked NIL and signed by the Tenderer.

PAGE	CLAUSE OR ITEM	PROPOSAL

Number of sheets, appended by the tenderer to this Schedule (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

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SCHEDULE 13 : RECORD OF ADDENDA TO TENDER DOCUMENTS

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

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Attach additional pages if more space is required.

Signed Date

Name Position

Tenderer

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 14: DAYWORKS SCHEDULE

This daywork statement shall be used according to the opinion of the Engineer for the assessment of value of additional work which cannot be assessed easily according to the rates in the Bill of Quantities.

The rates for labour and material should not include overhead costs and profit, Site Supervision of personnel, insurance, payed vacation, the use and maintenance of small hand equipment and non-mechanical equipment, travel allowance, other payments and allowance. Provision is being made for this by including the percentages covering all this items with the item "Up costs". The rate which should be used for the assessment of value of additional work is the basic rate plus the percentage "Up costs".

The item "Up Cost" is left out in the case of equipment. The rate then has to include all of the above "Up Costs" mentioned as well as operator's costs, user's goods, maintenance, etc.

The Tender has to fill in all of the items listed underneath otherwise his Tender can be considered as incomplete.

A. LABOUR

- | | | | |
|----|-------------|---------------------|---------------------|
| 1. | Workers . | per hour plus | % "Up-Cost" |
| 2. | Supervisors | per hour plus | % "Up-Cost " |
| 3. | Artisan. | per hour plus | % " Up-Cost " |

B. EQUIPMENT

DESCRIPTION	RATE PER HOUR	
	In Work	Standing
Front End-Loader.....
Tipper Truck ...6 cubic meters
Compressor.....(capacity)
.....(Specify)
.....(Specify)
.....(Specify)

NOTE: The rate for an air pressure machine has to include rubber pipes and pneumatic equipment.

C. MATERIAL

Here, The Tenderer has to provide the Up Cost which ought to be added to the basic price:%

SIGNED ON BEHALF OF TENDERER:

NAMA-KHOI MUNICIPALITY
BID/NC062/03/2023/2023
PROJECT NO.35008.00/2023/01
REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 15: MBD1

PART A
INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE NAMA KHOI MUNICIPALITY				
BID NUMBER:	NC062/03/2023/2023	CLOSING DATE:	08 March 2019	CLOSING TIME:
DESCRIPTION	REFURBISHMENT OF NABABEEP WASTE 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 (STREET ADDRESS

4 Namakwa Street
Springbok
8240

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]	<input type="checkbox"/> Yes <input type="checkbox"/> No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT	<input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES ENCLOSE PROOF]	ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?	<input type="checkbox"/> Yes <input type="checkbox"/> 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		CONTACT PERSON	
CONTACT PERSON		TELEPHONE NUMBER	
TELEPHONE NUMBER		FACSIMILE NUMBER	
FACSIMILE NUMBER		E-MAIL ADDRESS	
E-MAIL ADDRESS			

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 | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 3.2 DOES THE ENTITY HAVE A BRANCH IN THE RSA? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 3.3 DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 3.4 DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| 3.5 IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION? | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |

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:

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 16: DECLARATION OF INTEREST (FORM MBD 4)

1. No bid will be accepted from persons in the service of the state¹.
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.
3. In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.
 - 3.1. Full Name of bidder or his or her representative:.....
 - 3.2. Identity Number:.....
 - 3.3. Position occupied in the Company (director, trustee, shareholder²):.....
 - 3.4. Company Registration Number:.....
 - 3.5. Tax Reference Number:.....
 - 3.6. VAT Registration Number:.....
 - 3.7. The names of all directors/trustees/shareholders members, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below.
 - 3.8. Are you presently in the service of the state? **YES/NO**
 - 3.8.1. If yes, furnish particulars
.....
.....

¹ 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 of 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

²Shareholder" means a person who owns shares in the company and is actively involved in the management of the company or business and exercise control over the company.

- 3.9. Have you been in the service of the state for the past twelve months? **YES/NO**
 - 3.9.1. If yes, furnish particulars
.....
.....

3.10. 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**

3.10.1. If yes, furnish particulars

.....
.....

3.11. Are you aware of any relationship (family, friend, other) between any other 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**

3.11.1. If yes, furnish particulars

.....
.....

3.12. Are any of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES/NO**

3.12.1. If yes, furnish particulars

.....
.....

3.13. Is any spouse, child or parent of the company's directors, trustees, managers, principle shareholders in service of the state? **YES/NO**

3.13.1. If yes, furnish particulars

.....
.....

3.14. Do you or any of the directors, trustees, managers, principal shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract? **YES/NO**

3.14.1. If yes, furnish particulars

.....
.....

4. Full details of directors / trustees / members / shareholders.

Full Name	Identity Number	State Employee Number

CERTIFICATION

I, THE UNDERSIGNED (NAME)CERTIFY
 THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS 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

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 17: MBD 5

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

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

1. Are you by law required to prepare annual financial statements for auditing?.....**YES/NO**
 - 1.1 If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.
.....
.....
2. Do you have outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue more than 30 days?.....**YES/NO**
 - 2.1 If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days.
 - 2.2 If yes, please provide particulars.
.....
.....
3. Has any contract been awarded to you by any organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract?.....**YES/NO**
 - 3.1 If yes, furnish particulars
.....
.....
4. Will any portion of goods or services be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality/municipal entity is expected to be transferred out of the Republic?.....**YES/NO**
 - 4.1 If yes, furnish particulars
.....
.....

CERTIFICATION

**I, THE UNDERSIGNED (NAME)
CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT. I
ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO
BE FALSE.**

.....
Signature

.....
Date

.....
Position

.....
Name of Bidder

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 18: MBD 6.1

**PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT POLICY
OF NAMA KHOI MUNICIPALITY**

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

1.3 Points for this bid shall be awarded for:

- (a) Price;
- (b) B-BBEE Status Level of Contributor and
- (c) Specific Goals to Promote Economic Development (Locality)

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

	POINTS
PRICE	80
SPECIFIC GOALS	20
Total points for Price and Specific goals must not exceed	100

1.5 Failure on the part of a bidder to submit proof of B-BBEE Status level of contributor and proof of address (municipal account) together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution and specific goals to promote economic development (locality) 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

- (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;

B-BBEE Status Level of Contributor	Number of points for Preference [80 / 20]	Number of points for Preference [90/10]
1	10	5
2	8	4
3	6	3
4	4	2
5	2	1
6	2	1
7	2	1
8	2	1
Non-compliant Contributor	0	0

Points for Locality will be allocated as follows:

Local area of supplier	Number of Points for Preference	
	80/20	90/10
Within the boundaries of the Nama Khoi Municipality	10	5
Within the boundaries of Namakwa District Municipality	6	3
Within the boundaries of the Northern Cape	4	2
Outside of the boundaries of the Northern Cape	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. SPECIFIC GOALS POINTS CLAIMED IN TERMS OF PARAGRAPHS 1.4 AND 4.1

6.1 B-BBEE Status Level of Contributor: . =(maximum of 10 or 5 points)

6.2 LOCALITY =(maximum of 10 or 5 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 and proof of address.)

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

.....

.....

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 19: MBD 8

DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

1. This Municipal Bidding Document must form part of all bids invited.
2. It serves as a declaration to be used by 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. wilfully 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 as a company or person 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 National Treasury after the <i>audi alteram partem</i> rule was applied).	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.1.1	If so, furnish particulars:		
4.2	Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)? (To access this Register enter the National Treasury's website, www.treasury.gov.za , click on the icon "Register for Tender Defaulters" or submit your written request for a hard copy of the Register to facsimile number (012) 3265445).	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.2.1	If so, furnish particulars:		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Item	Question	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 <input type="checkbox"/>	No <input type="checkbox"/>
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 because of failure to perform on or comply with the contract?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.5.1	If so, furnish particulars:		

CERTIFICATION

I, THE UNDERSIGNED (NAME)
CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS 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

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 20: MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

1. This municipal Bidding Document (MBD) must form part of all bids¹ invited.
2. Section 4 (1)(b)(iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerned 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:

¹Includes price quotations, advertised competitive bids and proposals.

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

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 the 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 form, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium³ 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 the 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 bid and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties 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 term 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 exercise, property, capital, efforts, skill and knowledge in an activity for the execution of the contract.

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 21: SCM1

**AUTHORISATION FOR THE DEDUCTION OF OUTSTANDING AMOUNTS OWED TO
NAMA-KHOI MUNICIPALITY**

TO: THE MUNICIPAL MANAGER, NAMA-KHOI MUNICIPALITY

FROM:
(Name of bidder or consortium)

MUNICIPAL ACCOUNT NUMBER:

AUTHORISATION FOR THE DEDUCTION OF OUTSTANDING AMOUNTS OWED TO COUNCIL

Supply Chain Management Policy, Clause 21.d(ii)

The Municipal manager may reject the tender or quote of any juristic or natural person if that person or any of its directors/members has:

failed to pay municipal rates and taxes or municipal service charges and such rates, taxes and charges are in arrears for more than 30 days or without acceptable arrangements in terms of Debt Control and Collection Policy.

Debt Control and Credit Collection by-law, Provincial Gazette No. 756, Clause 5. (1)(2)

Enterprises which municipal accounts are in arrears are disqualified from bidding for municipal quotes, bids and contracts.

Enterprises which bid for municipal quotes and bids should provide a certificate, signed by the CFO, which certifies that the prospective bidders have no outstanding municipal accounts or should alternatively sign a authorisation for the deduction of outstanding amounts owed to the council.

I, THE UNDERSIGNED,
(FULL NAME IN BLOCK LETTERS)

hereby authorise RICHTERSVELD MUNICIPALITY to deduct the full amount outstanding by the business organization / Director / Partner, etc from any payment due to us / me.

.....
Signature

THUS DONE AND SIGNED for and on behalf of the Bidder

at on theday of 20

For office use:

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 22: SCM2

DECLARATION ON STATE OF MUNICIPAL ACCOUNTS

The completion of this form is **COMPULSORY**. Failure to complete this form might result that this tender will not be considered.

A Any bid will be rejected if:
any municipal rates and taxes or municipal service charges owned by the bidder or any of the directors to the municipality, are in arrears without any current arrangements.

B Tenderer Information

i. Name of tenderer

ii. Registration number

iii. Municipality where business is situated

iv. Municipal account number for rates

v. Municipal account number for water and electricity

vi. Names of all directors, their ID numbers and municipal account numbers.

1.

2.

3.

4.

5.

6.

C **Documents to be attached.**

i. A copy of the latest municipal account mentioned in B(iv) & (v)

ii. A copy of the latest municipal accounts of all directors or members mentioned in B(iv)

iii. Proof of directors/ or members & ID Documents.

I/We declare that the abovementioned information is true and correct and that the following documents are attached to this form:

.....

.....

.....

.....

SIGNATURE

DATE

NAMA-KHOI MUNICIPALITY

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SCHEDULE 23: CONTRACTOR'S CERTIFICATE OF REGISTRATION WITH CIDB

Attached hereto is my / our Contractor's Certificate of Registration with CIDB. My failure to submit the certificate with my / our tender document will lead to the conclusion that I am / we are not registered with the CIDB and therefore not eligible to tender.

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SCHEDULE 24: FORM OF INTENT TO PROVIDE A PERFORMANCE GUARENTEE

[The Tenderer must attach hereto a letter from the bank or institution. with whom he has made the necessary arrangements, to the effect that the said bank or institution will be prepared to provide the required performance guarantee when asked to do so].

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

SCHEDULE 25: RESOURCE COMMITMENT SCHEDULE

Contracts and Construction Manager	Name:.....		Contact details:.....
Available (Yes/No)	Signature	Responsibility	Project Designation

Site Foreman	Name:.....		Contact details:.....
Available (yes/No)	Signature	Responsibility	Project Designation

Site Agent	Name:.....		Contact details:.....
Available (yes/No)	Signature	Responsibility	Project Designation

Health and Safety	Name:.....		Contact details:.....
Available (yes/No)	Signature	Responsibility	Project Designation

Part C1: Agreements and Contract Data

	Pages
C1.1 Form of Offer and Acceptance (Agreement).....	75 - 78
C1.2 Contract Data	79 - 87
C1.3 Form of Guarantee.....	88 - 90
C1.4 Occupational Health and Safety Agreement	91 - 92

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C1.1 Form of Offer and Acceptance (Agreement)

Offer

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

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

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

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

Rand.

..... (in words);

R (in figures)

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

Signature(s)

Name(s)

Capacity

for the tenderer

(Name and
address of
organization/
tenderer

Name and
signature
of witness

Date

Acceptance *(TO BE COMPLETED AT ACCEPTANCE STAGE)*

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

The terms of the contract are contained in:

Part C1: Agreements and contract data (which includes this agreement)
Part C2: Pricing data
Part C3: Scope of work
Part C4: Site information

and drawings and documents or parts thereof, which may be incorporated by reference into the above listed Parts.

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

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

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

Signature(s)

Name(s)

Capacity

**for the
Employer** NAMA-KHOI MUNICIPALITY
PO BOX 17
SPRINGBOK
8240

Name and
signature
of witness

Date

Schedule of Deviations

Notes:

1. The extent of deviations from the tender documents issued by the employer before the tender closing date is limited to those permitted in terms of the conditions of tender.
2. A tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid, become the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties becomes an obligation of the contract shall also be recorded here.
4. Any change or addition to the tender documents arising from the above agreements and recorded here, shall also be incorporated into the final draft of the Contract.

1	Subject	_____
	Details	_____ _____ _____ _____
2	Subject	_____
	Details	_____ _____ _____ _____
3	Subject	_____
	Details	_____ _____ _____ _____
4	Subject	_____
	Details	_____ _____ _____ _____

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

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

For the Tenderer:

Signature(s)

Name(s)

Capacity

(Name and
address of
organization/
tenderer

Name and
signature
of witness

Date

For the Employer:

Signature(s)

Name(s)

Capacity

(Name and
Address of
organization)
NAMA-KHOI MUNICIPALITY
PO BOX 17
SPRINGBOK
8240

Name and
signature
of witness

Date

NAMA-KHOI MUNICIPALITY

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C1.2: CONTRACT DATA

GENERAL CONDITIONS OF CONTRACT

The following standardized General Conditions of Contract:

General Conditions of Contract for Construction Works (Third Edition) 2015

Prepared by the South African Institution of Civil Engineering (SAICE) shall apply to and from the General Conditions of Contract for this Contract. Copies of these conditions of contract are obtainable from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, Tel: (011) 805 5947, Fax: (011) 805 5971, e-mail: civilinfo@saice.org.za.

The General Conditions of Contract 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 to which it mainly applies.

The General Conditions of Contract shall be read in conjunction with the variations, amendments and additions set out in the Special Conditions of Contract below.

Save as amended in terms of this document, the provisions of the Standard Conditions of Contract – GCC 2015 shall remain unchanged.

The Contract Data must be read in conjunction with the schedule of Contract Specific Data included in Part C1.2.

C1.2.1 SPECIAL CONDITIONS OF CONTRACT

In this regard, the Standard Conditions of Contract – GCC 2015 is amended by the numbered clauses set out below, as follows:

- (i) where the Standard Conditions of Contract – GCC 2015 contains no provision with the corresponding clause number, the clause set out herein is inserted into the Contract; and
- (ii) where the Standard Conditions of Contract – GCC 2015 contains a provision with the corresponding clause number, it is amended or replaced, as set out herein. (Amendments/replacements are shown in *italics*).

Save as amended in terms of this document, the provisions of the Standard Conditions of Contract – GCC 2015 shall remain unchanged.

1.1 Definitions

- 1.1.1.1 "agreed" means agreed by the Employer and the Contractor; *or the Employer's Agent and the Contractor expressly authorised in terms of the Contract*, unless specifically stated otherwise.
- 1.1.1.5 "Commencement Date" means the date that the Contract, made in terms of the Form of Offer and Acceptance, comes into effect *by signing the Acceptance part and returning one fully completed copy of this document, the Contract Agreement*.
- 1.1.1.7 "Contract" means the documentation of the agreement between the parties in terms of the Form of Offer and Acceptance, and such written amendments or additions to the Contract as may be agreed *and signed by both parties*.
- 1.1.1.13 "Defects Liability Period" means the period stated in the Contract Data, commencing from the issue of the Certificate of Completion or Certificates of Completion in the event of more than one Certificate of Completion having been issued for different *portions of the Works*, during which the Contractor has both the right and the obligation to make good defects in the materials, Plant and workmanship covered by the Contract.
- 1.1.1.14 "Due Completion Date" means the *date or dates of the expiry of the time* stated in the Contract Data for achieving Practical Completion *for the whole or portions of the Works*, calculated from the Commencement Date and as adjusted by such extensions of time or acceleration as may be allowed *or agreed* in terms of Contract.
- 1.1.1.20 "Form of Offer and Acceptance" means the document *defined as the Contract Agreement* that formalises the legal process of offer and acceptance and gives rise to the Contract.
- 1.1.1.32 "*Temporary Works*" means the temporary works required for or in connection with the execution of the Permanent Works and shall include items which are not intended to be permanent or to form part of the Permanent Works, including but not limited to dewatering, shoring, lateral support, access roads, haul roads, shuttering, jacking pits and method, scaffolding, etc.:
- 1.1.1.35 "*parties*" means the Contractor and the Employer.
- 1.1.1.36 "*approved programme*" means the latest programme submitted by the Contractor and approved by the Employer's Agent. The latest programme approved by the Employer's Agent supersedes previous approved programmes.
- 1.1.1.37 "*Drawings*" means all drawings, calculations and technical information forming part of the Contract Documents and any modifications thereof or additions thereto from time to time approved in writing by the Employer's Agent or delivered to the Contractor by the Employer's Agent.
- 1.1.1.38 "*Letter of Notification*" means the letters of formal notification, signed by the Employer, of the decision of the Supply Chain Management Bid Adjudication Committee sent to all tenderers. The notification of the decision does not form part of the Employer's Acceptance of the successful tenderer's Offer and no rights shall accrue.

1.2 Interpretations

- 1.2.1 Any written communication between the parties shall have been duly delivered if:
- 1.2.1.1 Handed to the addressee or to his duly authorised agent; or
- 1.2.1.2 Delivered at the address of the addressee as stated in the Contract Data, *including an e-mail address; and*
- 1.2.1.3 *Any notice or claim required in accordance with this Contract shall be communicated separately from other communications, on a separate cover with specific reference to the clause in terms of which the communication was made*
- Provided that the Employer, Employer's Agent and Contractor shall be entitled, by written notice to each other, to change their said addresses.
- 1.2.6 *Any act or communication, including but not limited to "accept, agree, appoint, approve, certify, decide, delegate, dispute, elect, grant, inform, instruct, issue, notice, object, order, record, refuse,*

request, require, state, dispute, call for” and their derivatives indicate an act to be carried out in writing.

- 1.3.5 Except where otherwise stated in the Contract, the Contractor shall retain the copyright and other intellectual property rights in documents supplied by the Employer or Employer’s Agent under the Contract.

The Contractor shall legally be deemed to have given the Employer a non-terminable, transferable, non-exclusive, royalty-free licence to copy, use and communicate the Contractor’s documents, including making and using modifications of such documents for the purpose of further work required to the Works

The Contract Specific Data, Specifications (other than Standardized Specifications), Bill of Quantities and Drawings are the copyright of Lyners Consulting Engineers.

1.4 Non-Variation Clause

- 1.4.1 *This Contract is the entire contract between the parties regarding the matters addressed in this Contract. No representations, terms, conditions or warranties not contained in this Contract shall be binding on the parties. No agreement or addendum varying, adding to, deleting or terminating this Contract including this clause shall be effective unless reduced to writing and signed by both parties.*

2.4 Ambiguity or discrepancy

- 2.4.1 *The several documents forming the Contract are to be read and taken as mutually complementary to and explanatory to each other.*
- 2.4.2 *Any obscurity or ambiguity or discrepancy between the contract documents shall be referred to the Employer’s Agent before the due date of submission of tenders for decision as to the true intent and meaning and the Employer’s Agents’ interpretation. This decision shall be final and binding.*
- 2.4.3 *No claims will be entertained from the contractor on the grounds of any misunderstanding of the contract requirements, which should have and could have been clarified in this manner prior to tendering.*

2.5 Assignment

- 2.5.1 Neither the Contractor nor the Employer shall, without the written consent of the other, assign the Contract or any part thereof, or any obligation under the Contract, or cede any right or benefit thereunder. *Such assignment or cession shall be null and void without the other party’s consent.*

3.1 Qualifications of the Employer’s Agent

- 3.1.1 The natural person *appointed by the Employer to administer the Contract* shall be a registered professional in a built environment profession that is appropriate to the Scope of Work.

3.2 Functions of the Employer’s Agent

- 3.2.1 The function of the Employer’s Agent is to *administer the Contract in accordance with the provisions of the Contract.*

4.1 Extent of obligations and liability

- 4.1.1 The Contractor shall, save insofar as it is legally or physically impossible, design (to the extent provided in the *Contract Data*), execute and complete the Works and obligations remedy any defects therein in accordance with the provisions of the Contract.
- 4.1.2 *Where the Contract Data provides that part of the Works shall be designed by the Contractor,*
- 4.1.2.1 *the relevant part of the Works shall be fit for such purposes for which it is intended as are specified in the Contract, and*
- 4.1.2.2 *the Contractor shall, notwithstanding approval by the Employer’s Agent, be liable for any error or deficiency in any drawing or document supplied by him for that part of the Works, and for any loss or damage arising out of such error or deficiency.*
- 4.1.2.3 *the Contractor shall submit to the Employer’s Agent the “as-built” documents and operation and maintenance manuals in accordance with the Scope of Works and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair this part of the Works. Such part shall*

not be considered to be completed for the purposes of issuing a Certificate of Practical Completion in terms of Clause 5.14.1 as read with the relevant Contract data until these documents and manuals have been submitted to the Employer's Agent.

4.1.3 The Contractor shall be responsible for the design of the Temporary Works, such responsibility shall be that the relevant part of the Temporary Works shall be fit for such purposes for which it is intended and, the Contractor shall, notwithstanding approval by the Employer's Agent, be liable for any error or deficiency in any drawing or document supplied by him for that part of the Works, and for any loss or damage arising out of such error or deficiency.

4.1.4 The Contractor indemnifies the Employer against any liability for any breach of the provisions of Clause 4.1.

4.2 Employer's Agent's instructions

4.2.3 Should the Contractor fail to proceed with due diligence with any Employer's Agent's instruction, the Employer's Agent may notify the Contractor to proceed within 7 days from receipt of such notice. Without further notice, on default by the Contractor, the Employer may employ other parties or use its own resources to give effect to such instruction in addition to any other rights that the Employer may have inter alia in terms of Clause 9.2.1.3.6. The Employer may recover such costs from the Contractor resulting from same.

4.3 Legal provisions

4.3.3 The Employer and the Contractor shall enter into an agreement required for the construction of the Works in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (Act 85 of 1993) and the latest Construction Regulations promulgated thereunder.

An agreement is included in the Contract Document (C1.4 of Contract Data) and shall be completed and submitted to the Employer together with a letter of good standing from the Compensation Commissioner (if not insured with a Licenced Compensation Insurer) within fourteen (14) days after the Commencement Date. The Contractor shall ensure that any letter of good standing shall be timeously renewed in order that it remains in full force for the duration of the Contract.

4.5 Notices and Fees

4.5.2 The Employer shall be responsible for obtaining any planning approval required in respect of the Permanent Works. The Contractor shall be responsible for obtaining any planning approval required in respect of the Temporary Works.

4.11 Competent Employees

4.11.3 The Contractor shall only employ persons with the minimum number years applicable experience as shown below for the execution of work on this Contract: (Years' experience after obtaining qualifications)

Contract Manager	- minimum 10 years applicable experience
Construction Manager	- minimum 5 years applicable experience
Surveyor	- minimum 5 years applicable experience
All other key personnel	- minimum 5 years applicable experience

5.3 Commencement of the Works

5.3.1 Upon the Employer's Agent's instruction the Contractor shall, save as may be otherwise provided in the Contract or be legally or physically impossible, commence executing the Works. Such instruction shall be subject to the submission by the Contractor, and approval by the Employer, of documentation required before commencement with Works execution, as set out in the Contract Data.

The documentation required before commencement with Works execution are:

- Health and Safety Plan (Refer to Clause 4.3)
- Signed agreement in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (No. 85 of 1993) and the Construction Regulations promulgated thereunder.
- Initial programme (Refer to Clause 5.6)
- Security (Refer to Clause 6.2)

- *Insurance (Refer to Clause 8.6)”*
- *Letter of Good Standing from the Compensation Commissioner (if not insured with a Licensed Compensation Insurer).*

5.3.3 If the Employer's Agent's instruction to commence executing the Works, or to resubmit documentation *with reasons after having found to be unacceptable by the Employer*, is not received by the Contractor within 7 days from the actual date of the submission of *all* the documentation referred to in Clause 5.3.1, commencement of the Works shall be taken to be on the expiry of such 7 days. *However, deemed commencement of the Works shall not be construed as approval of the documentation submitted.*

5.4 Access to Site

5.4.3 If the Contractor suffers delay to Practical Completion and/or incurs proven additional cost from failure of the Employer to give *access to or possession* in accordance with the terms of this Clause, the Contractor shall be entitled to make a claim in accordance with Clause 10.1, for which purpose the time limits of 28 days provided in Clause 10.1.1.1 shall commence to run only from the time when *access to or possession* of the Site has actually been given.

5.6 Programme

5.6.1 *The Contractor shall deliver to the Employer's Agent as part the documentation required before commencement with Works execution in accordance with Clause 5.3.1, an initial programme and method statement for carrying out the Works in order to meet the Due Completion Date.*

5.6.2 The initial programme and all subsequent adjusted programmes shall show and, when relevant, describe *in method statements, the entire scope of the Works to be performed* including but not limited to:

5.6.2.1 The Commencement Date, commencement of the Works, Due Completion Date(s) *or revisions thereof, and the planned date(s) of Practical Completion for the Works as a whole or in respect of different portions of the Works.*

5.6.2.8 *Health and safety requirements*

5.6.2.9 *Critical path including the links between all predecessors and successors for activities on the critical path and float.*

5.6.3 *The Employer's Agent shall, within 14 days after the Contractor has submitted an initial or adjusted programme, approved such programme or rejected same with reasons and instruct the Contractor to amend such programme. Reasons for rejecting a programme are inter alia that it is not in accordance with the Contract or is not reflecting the actual progress.*

The Employer's Agents failure to approve or reject, with reasons, the submitted programme:-

5.6.3.1 *in the event of the submitted programme being an adjusted programme, shall be considered to be the approved programme; and*

5.6.3.2 *in the event of the submitted programme being an initial programme, it shall not be considered to be the approved programme. However, the Contractor shall have the right to suspend the Works in terms of Clause 5.11.1.3 and if the Contractor suffers delay to Practical Completion and/or incurs proven additional cost from such suspension, the Contractor shall be entitled to make a claim in accordance with Clause 10.1.*

5.6.4 The programme, *method statement* and the cash flow forecast shall be subject to *updates and review on a monthly basis. The Contractor shall monthly deliver to the Employer's Agent an adjusted programme reflecting actual progress and updated dates in accordance with Clause 5.6.2, even though it may reflect that the planned date(s) of Practical Completion will be later than the corresponding Due Completion Date(s), and in addition;*

5.6.4.1 *when instructed by the Employer's Agent,*

5.6.4.2 *when it no longer reflects the actual progress,*

5.6.4.3 *when a specific event, circumstance, act or omission may delay the execution of the Works, or*

5.6.4.4 *with each extension of time claim*

- 5.6.5 The submission to and approval by the Employer's Agent of any programme, method statement and/or cash flow forecast or its adjustments, or the delivery of any other relevant particulars, shall not relieve the Contractor of any of his duties or responsibilities under the Contract

5.7 Progress of the Works

- 5.7.3 The Employer's Agent may request the Contractor to submit, or the Contractor may submit to the Employer's Agent, a revised programme and cost determined in accordance with Clause 6.4 for accelerating the rate of progress to achieve Practical Completion before the Due Completion Date. *If accepted by the Employer, the adjusted Due Completion Date and the conditions for payment of cost shall be agreed in writing and signed by the parties prior to the Contractor commencing to accelerate progress.*

5.9 Instructions

- 5.9.3 The Contractor shall give adequate and appropriate written notice to the Employer's Agent of any instructions or drawings, which the Contractor may require for the execution of the Works and the Employer's Agent shall deliver such instructions and/or drawings to the Contractor. *The notice shall include details of the necessary drawing or instruction, details of by when it should be issued, and details of the nature and amount of the delay likely to be suffered if it is late.*

5.11 Suspension of the Works

- 5.11.1 The Contractor may, after giving fourteen (14) days written notice to the Employer, with a copy to the Employer's Agent, (with specific reference to this Clause) suspend the progress of the Works where the Employer or the Employers Agent has failed in terms of Clause 6.10.4 to:

- 5.11.1.1 Deliver a payment certificate, or

- 5.11.1.2 Make full payment of the amount certified in the payment certificate without prejudice to the Contractor's other rights under this Contract or by law, or

- 5.11.1.3 *Failed to approve an initial programme in terms of Clause 5.6.3.2*

5.12 Extension of the time for Practical Completion

- 5.12.1 *If circumstances of any kind whatsoever which occurred be such as fairly entitle the Contractor to an extension of time and are delaying or will actually delay Practical Completion of the Works beyond the Due Completion Date, the Contractor shall claim in accordance with Clause 10.1 such extension of time as is appropriate. Such extension of time shall take into account any special non-working days and all relevant circumstances, including concurrent delays or savings of time which might apply in respect of such claim and the Due Completion Date will be revised accordingly.*

- 5.12.2.2 Abnormal climatic conditions *provided that no extension of time will be granted in respect of any delays attributed to normal climatic conditions. Normal Climatic Conditions shall be deemed to include normal rainfall and associated wet conditions and materials, strong winds and extremes of temperature. However, in the event that delays to critical activities exceed the number of working days listed below, then abnormal climatic conditions shall be deemed to exist, and an extension of time shall be granted in accordance with the provisions of that Clause.*

The number of working days quoted below shall be regarded as a fair estimate of the delays to be anticipated and allowed for under normal climatic conditions where normal weather conditions prevent or disrupts critical work.

January	2 days
February	2 days
March	2 days
April	2 days
May	2 days
June	5 days
July	6 days
August	4 days
September	3 days

October	2 days
November	2 days
December	2 days

Claims for delays for abnormal climatic conditions shall be accompanied by substantiating facts and evidence, which shall be submitted timeously as each day or half-day delay is experienced.

Should an extension of time be granted by the Employer's Agent such extension of time will be added to the Time for Completion or set off against any over-provision that may have occurred in the above-mentioned schedule and any other claim.

It shall be further noted that where the critical path is not affected, no extension of time for abnormal climatic conditions or for any other reason will be entertained,"

5.12.2.5 *Any delay, impediment, or prevention caused by or attributable to the Employer, Employer's Agent, the Employer's personnel or the Employer's other contractors on the Site.*

5.12.4 *Instead of granting extension of time, if feasible, the Employer's Agent may request the Contractor to accelerate the rate of progress to achieve Practical Completion without extension of time and agree the cost for payment of such acceleration in accordance with Clause 5.7.3.*

5.13 Penalties for delay

5.13.2 *Delete*

5.14 Completion

5.14.1 *Save as otherwise provided in the Contract, the Contractor shall be entitled to receive a Certificate of Practical Completion when the Works have reached Practical Completion.*

When the Works are about to reach the said stage, the Contractor shall, in writing, request a Certificate of Practical Completion and the Employer's Agent shall, within 14 days after receiving such request, either where the Works;

5.14.1.1 *has reached Practical Completion issue a Certificate of Practical Completion to the Contractor and to the Employer or*

5.14.1.2 *has not reached Practical Completion, issue a written list to the Contractor defining the incomplete work and defects to be rectified to achieve Practical Completion.*

Should the Employer's Agent not issue a Certificate of Practical Completion or such a list within the 14 days, Practical Completion shall be considered to have been achieved on the expiry of the 14 days of the written request in terms of Clause 5.14.1. only once the complete set of As-built drawings and information were submitted by the Contractor to the Employer's Agent.

5.14.2 *As soon as the work referred to in the list issued in terms of Clause 5.14.1 has been duly completed and defects that manifested after the list was issued rectified, the Employer's Agent shall deliver to the Contractor and to the Employer a Certificate of Practical Completion together with a further written list setting out the work to be completed to justify the issuing of a Certificate of Completion.*

5.14.6 *The Employer need not occupy the Works before the Due Completion Date*

5.14.7 *If, in terms of the Contract Data stated for Clause 1.1.1.14, different times for achieving Practical Completion are specified in respect of different portions of the Works, the provisions for the Works as a whole shall apply with necessary adjustment in respect of such portions.*

5.16.3 *The Contractor's liability for any latent defects shall continue beyond the date of the Final Approval Certificate but the Employer shall have no claim against the Contractor arising out of any latent defect which first manifests itself later than the period, stated in the Contract Data, after the issue of the Final Approval Certificate in terms of this Clause.*

The Contractor's liability for any latent defects shall continue for 10 years from the date of the issue of the Final Approval Certificate.

6.2 Security

- 6.2.1 The Contractor shall deliver to the *Employer*, as part of the documentation required before commencement with Works execution in accordance with Clause 5.3.1, at his cost, the type of security for the due performance of the Contract, as selected in the Contract Data.
- 6.2.2 *If the Contractor fails to provide or maintain the security as selected in the Contract Data within the time period stated in Clause 5.3.2 or if the performance guarantee is not in accordance with the relevant pro forma performance guarantee, the Employer, in his sole discretion, may either*
- 6.2.2.1 *Hand over the Site to the Contractor and withhold payment from the Contractor until the amount withheld is equal to ten per cent (10%) of the Contract Price. Such amount shall be reduced to five per cent (5%) of the Contract Price when the Employer's Agent has issued a Certificate of Completion [5.14.4] and to zero per cent (0%) in the Final Payment Certificate [6.10.9] or*
- 6.2.2.2 *Terminate this Contract in terms of Clause 5.3.2 as read with Clause 9.2.1.3.2.*
- 6.2.3 *If the Contractor is to provide a performance guarantee as security, he shall ensure that it remains valid and enforceable until the Certificate of Completion is issued. The expiry date shall be specified in the performance guarantee as the date on which the Certificate of Completion is issued.*

6.5 Dayworks

- 6.5.1.2.3 The percentage allowances, stated in the Contract Data, in respect of the said remuneration of workmen and the cost of materials, which allowances shall be held to cover all charges for the Contractor's and subcontractor's *overheads and administration costs*, profits, timekeeping, *clerical work, insurances, establishment*, superintendence and the use of hand tools, and
- For items not included in the daywork schedule, the percentage allowance will be 10%.*

6.10 Payment

- 6.10.1 With regard to all amounts that become due to the Contractor in respect of the matters set out in Clauses 6.10.1.1, 6.10.1.2, 6.10.1.3, 6.10.1.4, and 6.10.1.5 below, *the Contractor* shall deliver to the Employer's Agent a monthly statement for payment of all amounts he considers to be due to him (in such form and on such date as may be agreed between the Contractor and the Employer's Agent, or failing agreement, as the Employer's Agent may require) and the Employer's Agent shall, by signed payment certificates issued to the Employer and the Contractor, certify the amount *considered* to be due to the Contractor *or the Employer*, taking into account the following:
- 6.10.1.5 The value up to the percentage limit stated in the Contract Data of Plant and materials referred to in Clause 6.9.1 *not yet built into the Permanent Works. No payment will be made for any Plant and/or materials off site, except if expressly agreed otherwise;*
- Provided that the Contractor has produced documentary evidence of ownership of such Plant and/or materials and has delivered to the Employer a MOS Guarantee in accordance with the pro forma MOS Guarantee, approved in writing by the Employer, against any claim to or in respect of such Plant and/or materials, including but not limited to claims by reason of the Contractor's sequestration or liquidation, or of any defect in the Contractor's title to the Plant and/or materials; and*
- Provided that the total amount of Plant and/or materials referred to in Clause 6.9.1 not yet supplied to Site or built into the Permanent Works certified for payment in terms of the Contract, notwithstanding*

the percentage limit stated in the Contract Data, shall be limited to the Guaranteed MOS Sum as reflected in the MOS Guarantee.

- 6.10.4 The Employer's Agent shall deliver to the Employer and the Contractor the payment certificate referred to in Clause 6.10.1 within 7 days of the receipt by the Employer's Agent of the Contractor's said statement. Any dissatisfaction in respect of such payment certificate shall be dealt with in terms of Clause 10.2. *The Employer or the Contractor, as the case may be, shall pay the amount due to the other within 28 days of receipt by the Employer and the Contractor of the payment certificate signed by the Employer's Agent. Payment shall be subject to the Contractor or the Employer, as the case may be, submitting a tax invoice, if required by law, to the other party for the amount due.*
- 6.10.8 Within 14 days of the date of the Certificate of Completion, the Contractor shall deliver to the Employer's Agent a completion statement showing the value of work done in respect of which a Certificate of Completion has been issued and shall supply such further information as the Employer's Agent may reasonably require. The Contractor shall not be entitled to any payment in respect of any matter which has not been included in such completion statement save as provided for in Clauses 5.14, 7.7 and 7.8 in respect of work executed during the Defects Liability Period and/or Clauses 10.3 to 10.11 in respect of any dispute. The Employer's Agent shall deliver to the Employer and the Contractor the payment certificate in respect of the completion referred to above within 14 days of the receipt by the Employer's Agent of the Contractor's said statement, and the Employer or the Contractor, as the case may be, shall pay the amount due to the other party within 28 days after receipt by the Employer and the Contractor of the payment certificate signed by the Employer's Agent.
- 6.10.9 Within 14 days of the date of final approval as stated in the Final Approval Certificate, the Contractor shall deliver to the Employer's Agent a final statement claiming final settlement of all moneys due to him (save in respect of matters in dispute, in terms of Clauses 10.3 to 10.11, and not yet resolved). The Employer's Agent shall within 14 days issue to the Employer and the Contractor a Final Payment Certificate, the amount of which shall be paid to the Contractor or the Employer, as the case may be, within 28 days of the date of such certificate, after which no further payments shall be due to the Contractor (save in respect of matters in dispute, in terms of Clauses 10.3 to 10.11 and not yet resolved).

8. RISKS AND RELATED MATTERS

8.6 Insurances

- 8.6.1.6 *In addition to the insurances required in terms of General Conditions of Contract Clauses 8.6.1.1 to 8.6.1.4 the following insurance is also required:*
- (a) Insurance of Construction Plant and Equipment (including tools, offices and other temporary structures and contents) and other things (except those intended for incorporation into the Works) brought onto the site for a sum sufficient to provide for their replacement.*
 - (b) Insurance in terms of the provisions of the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993.*
 - (c) Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger Liability Indemnity.*

(d) *Where the contract involves manufacturing and/or fabrication of the works or part thereof at premises other than the Site, the Contractor shall satisfy the Employer that all materials and equipment for incorporation in the works are adequately insured during manufacture and/or fabrication. In the event of the Employer having an insurable interest in such works during manufacture or fabrication then such interest shall be noted by endorsement to the Contractor's Policies of Insurance.*

(e) *Lateral Support liability insurance.*

8.6.8 *The evidence that the insurances have been affected in terms of Clause 8.6.1, shall be in the form of an insurance broker's warranty worded precisely as given in part C1.6 Insurance Broker's Warranty.*

9.2 Termination by Employer

9.2.1.3.2 *Has failed, in terms of Clause 5.3.2, to submit documentation in time, or to submit acceptable documentation, or to maintain and extend the validity of the performance guarantee until the Certificate of Completion; or*

9.2.1.3.6 *Is not executing the Works in accordance with the Contract, or is neglecting or failing to carry out his obligations under the Contract, inter alia to comply with any instruction under Clause 4.2; or*

9.2.1.3.9 *The Contractor fails to submit the documents within the number of days stipulated or if the documents submitted are found to be unacceptable in accordance with Clause 5.3.2*

9.2.1.3.10 *The Contractor committed a corrupt or fraudulent act during the procurement process or the execution of the Contract.*

9.2.1.3.11 *An official or other role player committed any corrupt or fraudulent act during the procurement process or in the execution of the Contract that benefited the Contractor.*

10.1 Contractor's Claim

10.1.1 *The following provisions shall apply to any claim by the Contractor for an extension of time for Practical Completion of the Works in terms of Clause 5.12, or in terms of any Clause that refers to Clause 10.1 for additional payment or compensation:*

10.1.1.1 *The Contractor shall within 28 days after the commencement of each circumstance, event, act or omission giving rise to such a claim, deliver to the Employer's Agent a written claim, referring to this Clause and setting out:*

10.1.1.1.1 *The particulars of the circumstance, event, act or omission giving rise to the claim concerned,*

10.1.1.1.2 *The provisions of the Contract on which he bases the claim*

10.1.1.1.3 *The length of the extension of time, if any, claimed and the basis of the calculation by incorporating the effects of each circumstance, event, act or omission on the critical path of an Approved Programme, indicating the delay on Practical Completion, and*

10.1.1.1.4 *The amount of money claimed and the basis of calculation thereof.*

10.1.1.2 *If, by reason of the nature and circumstances of the claim, the Contractor cannot reasonably comply with all or any of the provisions of Clause 10.1.1.1.1 to 10.1.1.1.4 to deliver a claim within the said period of 28 days, he shall:*

- 10.1.1.2.1 Within the said period of 28 days *issue a further notice referring to the relevant notice in terms of Clause 10.1.2* and confirming his intention to make the claim and comply with such of the requirements of Clause 10.1.1.1.1 to 10.1.1.1.4 as he reasonably can, and
- 10.1.1.2.2 As soon as practicable, comply with such of the requirements of Clause 10.1.1.1.1 to 10.1.1.1.4 as have not yet been complied with.
- 10.1.1.3 If the *circumstance, event, act or omission relating to the claim* are of an ongoing nature:
- 10.1.1.3.1 *the Contractor shall, within 14 days after the commencement of each circumstance, event, act or omission giving rise to such a claim, deliver to the Employer's Agent a written notice of his intention to submit a claim, referring to this Clause and setting out the particulars of the circumstance, event, act or omission. Provided that the additional payment or compensation or delay that occurred before 14 days prior the date on which the notice in terms of this clause was delivered, shall be deemed to be covered by the rates and/or prices set out in the Pricing Data and the time stated in the Contract Data relating to Clause 5.5.1*
- 10.1.1.3.2 *The Contractor shall, in addition to delivering the said further notice within 28 days in terms of Clause 10.1.1.2.1, each month deliver to the Employer's Agent, in writing, updated particulars required in terms of Clause 10.1.1.1.1 to 10.1.1.1.4 and, within 28 days after the end of the circumstance, event, act or omission deliver his final claim.*
- 10.1.2 *The Contractor shall issue an early warning notifying the Employer's Agent as soon as he becomes aware of any circumstance, event, act or omission which could:*
- 10.1.2.1 *Increase the Contract Prices,*
- 10.1.2.2 *Delay Practical Completion, or*
- 10.1.2.3 *Impact on the quality or*
- 10.1.2.4 *Impair the performance of the Works in use*
- 10.1.3.6 The Employer, the Employer's Agent and the Contractor shall not in any proceedings in accordance with Clauses 10.3 to 10.11 be entitled to give or lead evidence of or rely on any fact or circumstance not recorded in *terms of this Clause*.
- 10.1.4 If, in respect of any claim to which this Clause refers, the Contractor fails to deliver his claim within the *28 day claim period in terms of Clause 10.1.1.1* or does not deliver a further notice *within the period of 28 days in terms of Clause 10.1.1.2.1* or does not deliver his final claim *within 28 days after the circumstance, event, act or omission ceased in terms of Clause 10.1.1.3.2*, the Due Completion Date shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged all liability in connection with the claim.
- Should the Contractor fail to give an early warning notice in terms of Clause 10.1.2 which an experienced Contractor could have given, then the claim shall be assessed by the Employer's Agent and the ruling in terms of Clause 10.1.5 shall take into account the lack of mitigation measures that could have been employed if the Contractor had given an early warning notice.*
- 10.1.5 Unless otherwise provided in the Contract, the Employer's Agent shall within 28 days after the Contractor has delivered his *claim in terms of Clause 10.1.1*, give effect to Clause 3.2.2 and deliver to the Contractor and the Employer his written and adequately reasoned ruling on the claim (referring specifically to this Clause). The amount thereof, if any, allowed by the Employer's Agent shall be

included to the credit of the Contractor the next payment certificate. *Where the Employer's Agent fails to make a ruling within such 28 days the claim shall be deemed to be refused;*

Provided that:

- 10.1.5.1 The said period of 28 days may be extended if so agreed between the Contractor and the Employer's Agent *prior to the expiry of such 28 days*, and
- 10.1.5.2 Any amount that has been established to the satisfaction of the Employer's Agent, before his ruling on the whole claim, shall be included to the credit of the Contractor in the next payment certificate.

10.3 Dispute Notice

- 10.3.1 *Any dispute of whatsoever nature arising out of this Contract concerning any of the rights and/or obligations of any party thereto, either during the Time for Completion of the Contract or after the completion thereof, including any dispute as to the validity of the Contract, shall be referred to adjudication in terms of Clause 10.5. The Contractor or the Employer, hereinafter referred to as "the parties", may deliver to the other a written notice, hereinafter referred to as a "Dispute Notice", of any*

10.10 Common Provisions

- 10.10.1 Nothing herein contained shall deprive the Contractor *or the Employer of either party's right to* institute immediate court proceedings in respect of failure by *the Employer or the Contractor, as the case may be*, to pay the amount of a payment certificate on its due date, or to pay any amount of retention money on its due date for payment.
- 10.10.3 The *Adjudication Board*, arbitrator and the court shall have full power to open up, review and revise any ruling, decision, order, instruction, certificate or valuation of the Employer's Agent.

The Arbitrator and the court shall have full power to and to reconsider any decision by the Adjudication Board relevant to the matter in dispute, and neither party shall be limited in such proceedings before such arbitrator or court to the evidence or arguments put before the Employer's Agent for the purpose of obtaining his ruling, or the Adjudication Board for the purpose of obtaining a decision.

11. ADDITIONAL CONDITIONS OF CONTRACT

11.1 Details to be confidential

- 11.1.1 *The Contractor shall treat the details of the Works comprised in this Contract as private and confidential (save in so far as may be necessary for the purposes hereof) and shall not publish or disclose the same or any particulars thereof in any trade or technical paper elsewhere without the prior written consent of the Engineer.*

C1.2.2 CONTRACT SPECIFIC DATA

The following contract specific data, referring to the **General Conditions of Contract 2015 3rd Edition**, are applicable to this Contract:

Clause 1.1.1.13:

The Defects Liability Period is **12 months** and will commence upon the issue of a certificate of practical completion.

Clause 1.1.1.15:

"Employer" means the **NAMA-KHOI MUNICIPALITY**. The Chairman acting in his capacity as executive officer as well as any officer to whom any powers vested in the Board have been delegated.

Clause 1.1.1.16:

The **Engineer**, referred to in the documents, is the firm of **BVi Consulting Engineers Northern Cape (Pty) Ltd** acting through a director, an associate or an official authorized thereto in writing.

The name of the Engineer is: **BVi Consulting Engineers Northern Cape (Pty) Ltd** or their successors duly appointed by the Employer.

Clause 1.1.1.26:

The Pricing Strategy is a Re-measurement Contract.

Add the following clauses after Clause 1.1.1.34:

1.1.1.35 **"Drawings"** means all drawings, calculations and technical information forming part of the Contract Documents and any modifications thereof or additions thereto from time to time approved in writing by the Engineer or delivered to the Contractor by the Engineer.

1.1.1.36 **"Letter of Notification"** means the letters of formal notification, signed by the Employer, of the decision of the Supply Chain Management Bid Adjudication Committee sent to all tenderers. The notification of the decision does not form part of the Employer's Acceptance of the successful tenderer's Offer and no rights shall accrue.

Clause 1.2.1.2:

The address of the Employer is: NAMA-KHOI MUNICIPALITY
PO BOX 17
SPRINGBOK
8240
Tel.: 027 718 8100
Fax: 027 718 2661

Email Address: Christo.bonn@namakhoi.gov.za

The address of the Engineer is: 55 Bult Street
UPINGTON
8800
Tel: (054) 337 6600
Fax: (054) 337 6699

Email Address: gertm@bvinc.co.za

Clause 3.1.3:

The Engineer shall obtain the specific approval of the Employer before executing any of his functions or duties according to the following Clauses of the General Conditions of Contract:

1. Clause 3.2.1 Nomination of Engineer's Representative
2. Clause 3.2.4 Engineer's authority to delegate
3. Clause 5.8.1 Non-working times

4. Clause 5.11.1 Suspension of the Works
5. Clause 5.12.4 Acceleration instead of extension of time

Clause 4 : BASIS OF CONTRACT

Add the following before subclause 4.1.1:

“Contract Agreement”

The Contractor and the Employer shall enter into a Contract Agreement within 21 days after the Contractor receives the written notice of C1.1.2 Acceptance, unless they agree otherwise. The Contract Agreement shall be based upon the C1.1.4 Contract Agreement form included in the tender document. The costs of duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.”

Notwithstanding the above, the Contractor will not be permitted in terms of the conditions of contract identified in the Contract Data to enter into a Contract Agreement before:

- (1) C1.1.3 Schedule of Deviations has been negotiated, agreed and signed off by the Contractor and the Employer;
- (2) C1.3 Form of Guarantee has been completed by the Contractor and approved by the Employer;
- (3) An original valid Tax Clearance Certificate (valid on date of signing the Agreement) has been submitted and approved;
- (4) Insurances (as specified) with proof of validity have been provided by the Contractor and approved by the Employer;
- (5) C1.4 Occupational Health and Safety Agreement has been completed and signed by both parties;
- (6) Proof of payment in terms of Compensation for Occupational Injuries and Diseases Act, 1993 has been provided by the Contractor and approved by the Employer.

Clause 4.3:

Add the following clause after Clause 4.3.2.:

- 4.3.3 The Employer and the Contractor shall enter into an agreement to complete the work required for the construction of the works in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations promulgated thereunder.

An agreement is included in the Contract Document (C1.4 of Contract Data) and shall be completed and submitted to the Employer together with a letter of good standing from the Compensation Commissioner (if not insured with a Licenced Compensation Insurer) within fourteen (14) days after the Commencement Date. The Contractor shall ensure that any letter of good standing shall be timeously renewed in order that it remains in full force for the duration of the Contract.

- 4.3.4 The Contractor shall provide proof to the Employer, within 14 days from the date of delivery of the Acceptance, that he has paid all contributions required in terms of the Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993.”

Clause 4.4.3

Add the following new sub clause:

- 4.4.3.1 “The procedure for Selected Subcontractors shall be:

All specialist merchants, tradesmen and others executing any work or supplying any goods for which provisional or prime cost sums are provided in the Bill / Schedule of Quantities and who are selected for this purpose by the Contractor as specified hereafter, shall in the execution of such work be subcontractors of the Contractor and are herein referred to as “Selected Subcontractors”.

Unless another procedure is specified, Selected Subcontractors are chosen and appointed as follows. The Employer and the Contractor shall compile a list of firms or persons acceptable to both and who will be invited to submit tenders for certain work or goods to be supplied by Selected Subcontractors. Before the closing date of such tenders the Contractor shall furnish the Employer with a sealed list in which is indicated the price increase required by the Contractor regarding the handling and appointment of every tenderer as Selected Subcontractor. No price increase requested by the Contractor in such list may be higher than the percentage or amount the Contractor has tendered in the main Contract against the provisional or prime cost item concerned. The list is then opened with the tenders and on the basis thereof the Employer shall indicate which tender he wishes to accept. The Contractor shall accept the tenderer and appoint him as Selected Subcontractor.

The Contractor shall incorporate in the subcontract provisions that:

- a) In respect of the work or the goods that are the subject of the subcontract the Selected Subcontractor undertakes to the Contractor mutatis mutandis the obligations and liabilities as are imposed upon the Contractor to the Employer in terms of the Contract, and holds the Contractor harmless from and indemnifies him against the same and in respect of all claims demands, lawsuits, damages, costs, charges and expenses whatsoever arising out of or in connection therewith, or arising out of or in connection with any failure to perform such obligations or to fulfil such liabilities, and,
- (b) The Selected Subcontractor holds the Contractor harmless and indemnifies him against:
 - (i) Shortcomings in the subcontract works if and where the works were designed by the Selected Subcontractor;
 - (ii) defects in the goods if and where the goods were manufactured and/or supplied by the Selected Subcontractor;
 - (iii) any negligence by the Selected Subcontractor, his agents, workmen and servants;
 - (iv) any misuse by the Selected Subcontractor of any Constructional Plant, Temporary Works or materials provided by the Contractor for the purposes of the Contract;
 - (v) any claims as aforesaid.

Clause 5.3.1:

The documentation required before commencement with Works execution is:

- (1) Health and Safety Plan (Refer to Clause 4.3)
- (2) Construction programme (Refer to Clause 5.6)
- (3) Security (Refer to Clause 6.2)
- (4) Insurance (Refer to Clause 8.6)
- (5) Occupational Health and Safety Agreement (C1.4 of the Contract Document)
- (6) Letter of Good Standing from the Compensation Commissioner (if not insured with a Licensed Compensation Insurer)
- (7) Construction Guarantee to execute the works.

Clause 5.3.2:

The time to submit the documentation required before commencement with Works execution is 14 days.

Add the following clause after Clause 5.3.3:

5.3.4: The Contractor shall commence executing the works within 28 days from the Commencement Date.

The Commencement Date will be the day when all of the following takes place:

- Site Handover to the Contractor
- The Completion of the Form of Offer and Acceptance

The above will take place within 7 days of the issue of the Letter of Acceptance.

Clause 5.4.2:

Access to and possession of the site shall not be exclusive to the Contractor insofar as the provisions of Clause 4.8 apply, and where on-going use by the general public is required.

Add the following clause after Clause 5.4.3:

5.4.4 "The Contractor shall bear all costs and charges for special and temporary rights of way required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional facilities outside the Site required by him for the purposes of the Works."

Clause 5.6.1:

The Contractor shall deliver a detailed programme of work to the Engineer within 14 days from the Commencement Date.

Clause 5.8.1:

Non-working days are Sundays.

Special non-working days are all gazetted public holidays falling outside the year end break.

Add the following clause after 5.8.2:

5.8.3 The year end break commences on 16 December and ends on the second Sunday in January the next year.

Clause 5.9:

Add the following:

5.9.8: "Three paper prints of each Drawing will be furnished free of charge to the Contractor. Additional prints of the same Drawings will be for the Contractors account".

5.9.9: "Only dimensions shown on the Drawings may be used for the construction of the Works and no dimension may be scaled without the written instruction of the Engineer. All dimensions shown on the drawings must be checked by the Contractor on Site before any part of the Works is commenced with".

Clause 5.12.2.2:

No extension of time will be granted in respect of any delays attributed to normal climatic conditions. Normal Climatic Conditions shall be deemed to include normal rainfall and associated wet conditions and materials, strong winds and extremes of temperature. However in the event that delays to critical activities exceed the number of working days listed below for each month, then abnormal conditions shall be deemed to exist, and an extension of time shall be granted in accordance with the provisions of Clause 5.12.

The number of **working days** quoted below shall be regarded as a fair estimate of the delays to be anticipated and allowed for under normal climatic conditions where inclement weather prevents or disrupts critical work.

January	0 days
February	1 day
March	1 day
April	1 day
May	2 days
June	3 days
July	2 days
August	1 day
September	0 days
October	0 days
November	0 days
December	0 days

Clause 5.13.1:

The penalty for failing to complete the Works is **R4 500 per calendar day**.

Clause 6.2.1:

The security to be provided by the Contractor shall be a **performance guarantee of 10% of the Contract Sum** and must be delivered to the Engineer within **14 days** after receipt of the Commencement Date. The performance guarantee shall contain the wording of the document included in **C1.3 Form of Guarantee**.

Clause 6.2.3:

Delete Clause 6.2.3 in its entirety and replace with the following:

The Contractor shall ensure that the performance guarantee remains valid and enforceable until the Certificate of Completion of the Works is issued.

Clause 6.3:

Add the following after Clause 6.3.3:

6.3.4.1: If the scope of the work increased or decreased by a percentage in excess of 25% the tendered amounts in Section 1200AH items 1.2 will be adjusted pro-rata. No changes to the above items will be considered in case of an increase or decrease of less than 25% variation in the contract amount.

6.4.3.2: All rates will be fixed as tendered irrespective of the percentage variation.

Subclause 6.6.1 : Provisional sums

In the second line of subclause 6.6.1.2, after the words "sum or sums" insert the words ", excluding VAT,".

In the first line of subclause 6.6.1.2.1, after the words "sum or sums" insert the words ", excluding VAT,".

In the fourth line of subclause 6.6.1.2.2, after the words "amount" insert the words ", excluding VAT,".

Subclause 6.6.2 : Prime cost sums

In the fourth line of subclause 6.6.2, after the words "price" insert the words ", excluding VAT,".

Clause 6.8.2:

The value of the certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule with the following values:

x = N/A

a = N/A

b = N/A

c = N/A

d = N/A

The Consumer Price Index "L" to be used shall be the index for the Northern Cape's "other urban areas" as published in the Statistical News Release, P0141.1, Table 21.

The base month for the purposes of calculating Contract Price Adjustment (CPA) shall be **NOT APPLICABLE**.

NOTE: The contract price adjustment factor **SHALL BE NOT APPLICABLE**.

Clause 6.8.3:

Price adjustments for variations in the costs of special materials are not allowed.

Clause 6.8.4:

Add the following to Clause 6.8.4:

Notwithstanding the above, in the event that a public holiday is proclaimed after 28 days before the closing date for tenders, no costs other than those that can be claimed under Clause 5.12.3 shall be added to the contract price.

Clause 6.10.1.5:

The percentage advance on materials not yet built into the Permanent Works is **80%**, upon proof of ownership.

Subclause 6.10.2:

Add the following:

"Payment to the Contractor for any materials on site shall only be authorized after proof of ownership by the Contractor has been lodged with the Engineer in the form of receipted invoices or other acceptable documents."

Clause 6.10.3:

Add the following to Clause 6.10.3:

Notwithstanding the provision of a performance guarantee in terms of Clause 6.2.1, interim payments to the Contractors shall be subject to retention by the Employer of an amount of **10%** of the said amounts due to the

Contractor, with no limit. The limit of retention money for the defects Liability Period shall be 5% of the Contract Price, including payment for contingencies and Contract Price Adjustment. A guarantee in lieu of retention is not permitted.

The limit of retention money is 10% of the Contract Price, including allowances for contingencies and Contract Price Adjustment.

The limit of retention money for the Defects Liability Period shall be 5% of the Contract Price.

Clause 6.10.4:

Add the following to clause 6.10.4:

Notwithstanding the above, the Engineer shall be empowered to withhold the delivery of the payment certificate until the Contractor has complied with his obligations to report in terms of Clause 4.10.2 and as described in the Scope of Work.

Clause 6.10.5.1:

In the sixth line, delete the words “.. Of the second half ..”

Clause 6.10.10: Tax Invoices

Section 20(1) of the Value Added Tax Act of 1991 (Act 89 of 1991) requires that a supplier (person supplying goods or services) who is registered as a VAT vendor issue to the recipient a tax invoice within 21 days of the date of a supply whether requested or not.

The Contractor shall provide a tax invoice (VAT invoice) which shall be included with each payment certificate delivered to the Employer by the Engineer in terms of Clauses 49.1 and 49.10. Failure by the Contractor to provide a tax invoice (VAT invoice) timeously may delay payment by the Employer and no interest shall accrue.

Clause 6.11:

Amend the percentage from 15 percent to 25 percent in the title and in the Clause.

Clause 8.6.1:

Clause 8.6.1.1.2:

The value of Plant and materials supplied by the Employer to be included in the insurance sum is **R 0.00 (Nil)**.

Clause 8.6.1.1.3:

The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is R 450 000.00.

The limit of indemnity for liability insurance is **R5 000 000.00 for any single claim** – the number of claims to be unlimited during the construction and defects liability periods.

Clause 8.6.1.5:

In addition to the insurances required in terms of General Conditions of Contract Clauses 8.6.1.1 to 8.6.1.4 the following insurance is also required:

- (a) Insurance of Construction Equipment (including tools, offices and other temporary structures and contents) and other things (except those intended for incorporation into the Works) brought onto the site for a sum sufficient to provide for their replacement.
- (b) Insurance in terms of the provisions of the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993.
- (c) Motor Vehicle Liability Insurance comprising (as a minimum) “Balance of Third Party” Risks including Passenger Liability Indemnity.
- (d) Where the contract involves manufacturing and/or fabrication of the works or part thereof at premises other than the Site, the Contractor shall satisfy the Employer that all materials and equipment for incorporation in the works are adequately insured during manufacture and/or fabrication. In the event of

the Employer having an insurable interest in such works during manufacture or fabrication then such interest shall be noted by endorsement to the Contractor's Policies of Insurance.

Clause 9.2.1:

Add the following to Clauses after Clause 9.2.1.3.7:

- 9.2.1.3.8 The Contractor committed a corrupt or fraudulent act during the procurement process or the execution of the contract.
- 9.2.1.3.9 An official or other role player committed any corrupt or fraudulent act during the procurement process or in the execution of the contract that benefited the Contractor.
- 9.2.1.3.10 “The Contractor fails to provide the required Guarantee and insurances within the prescribed time.”

Clause 10.5.:

Dispute resolution shall be by mediation, failing which by arbitration.

Clause 10.8.1:

“The determination of disputes shall be by Court proceedings.”

Add the following after Clause 10:

Clause 11: Contractor to provide everything necessary

The Contractor is to provide all labour, material, workmanship, machinery, and everything which is or may be necessary in and for the execution and entire completion of the Contract in accordance with the Conditions of Contract, Drawings and Scope of Work.

Clause 12: Details to be confidential

The Contractor shall treat the details of the Works comprised in this Contract as private and confidential (save in so far as may be necessary for the purposes hereof) and shall not publish or disclose the same or any particulars thereof in any trade or technical paper elsewhere without the prior written consent of the Engineer.

C1.2.3 CONTRACT ADDITIONAL DATA (Additional Conditions of Contract)

C1.2.3.1 Contract Participation goals

The following contract additional data, referring to the **Clients Procurement Policies** are applicable to this Contract and it is a requirement of this contract that the Main Contractor (be a Joint Venture agreement or a consortium or a single organization) must comply with the following minimum contract participation goals:

C1.2.3.1.1 Employment of Temporary Labour Force

Employ ALL unskilled and semi-skilled temporary workforce required for the contract from the **community of Nababeep.**

C1.2.4 SUMMARY OF CONTRACT SPECIFIC DATA

Reference to	Clause	Information
Contractor	1.1.1.9	
Employer	1.1.1.15	Nama Khoi Municipality
	1.2.1.2	NAMA-KHOI MUNICIPALITY PO BOX 17 SPRINGBOK 8240 Tel.: 027 718 8100 Fax: 027 718 2661
Engineer	1.1.1.16	BVi Consulting Engineers 55 Bult Street UPINGTON,8800 Tel. No: 054 337 6600 Fax No: 054 337 6699
Contract Guarantee	6.2.1	Within 14 days of the Commencement Date
Guarantee Sum	6.2.1	10% of the total tender award sum
Commencement of Works	5.3.2	Within 14 days of Commencement Date
Programme of Works	5.6.1	Within 14 days of Commencement Date
Insurances	8.6.1.1.2	R0-00
	8.6.1.1.3	R 450 000-00
Limit of indemnity	8.6.1.1.3	R 5 000 000-00 per claim, claims unlimited during construction and defects liability periods
Other Insurances	8.6.1.5	To be included in Contractors All-Risk Insurance
Daywork percentages	6.5.1	Refer to Schedule 14 of Part T2 Returnable Documents
Special non-working days	5.8.1	Sundays and all public holidays as well as year-end breaks.
Penalty for Delay	5.13	The penalty for failing to complete the Works within the Tendered Contract Period is R 4 500-00 per calendar day .
Contract Price Adjustment a = N/A b = N/A c = N/A d = N/A	6.8.2	The following values for the different factors are to be used: x = N/A a = Labour b = Contractor's Equipment c = Material d = Fuel CPA – NOT APPLICABLE
Special Materials	6.8.3	are NOT allowed
Minimum amount of interim payment certificate	6.10.1	Cashflow must correlate with specified Contract Period
Materials on Site	6.10.1.5	80%
Retention Money	6.10.3	The percentage retention on the amounts due to the contractor is 10% of Contract Price, with no limit
Defects Liability Period	1.1.1.13	12 Months from the issuing of Certificate of Completion
Dispute Resolution	10.8.1	Adjudication, Arbitration and the Court will be acceptable dispute resolution mechanisms
Minimum Contract Participation goals:		
Temporary Workforce Employment	C1.2.3.1.1	To be employed from Nababeep community

SIGNED ON BEHALF OF TENDERER:

.....

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

C1.3 Form of Guarantee

Contract No

WHEREAS **NAMA-KHOI MUNICIPALITY**
(hereinafter referred to as the Employer") entered into, a Contract with:
.....
(hereinafter called "the Contractor") on the day of 20.....,
for
.....
at(indicate site location).

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 fulfilment 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

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

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

Signature

Duly authorized to sign on behalf of

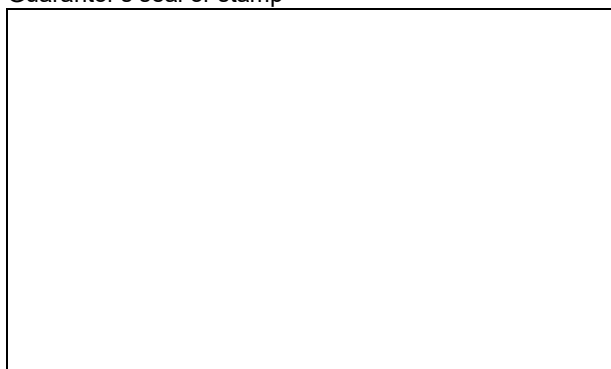
Address
.....
.....

As witnesses:

1

2

Guarantor's seal or stamp



ANNEXURE

LIST OF APPROVED FINANCIAL INSTITUTIONS

The following financial institutions are approved for issue of contract guarantees:

National Banks:

ABSA Bank Ltd.
Development Bank of Southern Africa
FirstRand Bank Ltd.
Gensec Bank Ltd.
Imperial Bank Ltd.
Infrastructure Finance Corporation
Investec Bank Ltd.
Land & Agricultural Bank of SA
Mercantile Bank Ltd.
Nedbank Ltd.
Standard Bank of SA Ltd.
SA Bank of Athens

International Banks (with branches in SA):

ABN AMRO Bank n.v.
Barclays Bank plc.
Citibank n.a.
Commerzbank Aktiengesellschaft
Credit Agricole-Indosuez
Deutsche Bank AG
JP Morgan Chase Bank
Societe Generale
Standard Chartered Bank

Insurance companies:

ABSA Insurance
AIG South Africa
Auto & General
Coface s.a.
Compass Insurance Co.
Constantia Insurance Co.
Credit Guarantee Insurance Co.
Emerald Insurance Co.
Federated Employers Mutual Assurance Co.
Guardrisk Insurance Co.
Home Loan Guarantee Co.
Lion of Africa Insurance Co.
Lombard Insurance
MUA Insurance
Mutual & Federal Insurance Co.
New National Assurance Co.
Regent Insurance Co.
Zurich Insurance Co.

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTEWATER TREATMENT WORKS

C1.4 Occupational Health and Safety Agreement

AGREEMENT MADE AND ENTERED INTO BETWEEN NAMA-KHOI MUNICIPALITY (HEREINAFTER CALLED THE "EMPLOYER") AND

.....
(Contractor/Mandatory/Company/CC Name)

IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, ACT No. 85 OF 1993 AS AMENDED.

I,, representing
....., as an employer in
its own right, do hereby undertake to ensure, as far as is reasonably practicable, that all work will be performed,
and all equipment, machinery or plant used in such a manner as to comply with the provisions of the Occupational
Health and Safety Act (OHSA) and the Regulations promulgated thereunder.

I furthermore confirm that I am/we are registered with the Compensation Commissioner and that all registration
and assessment monies due to the Compensation Commissioner have been fully paid or that I/We are insured
with an approved licensed compensation insurer.

COID ACT Registration Number:

OR Compensation Insurer: Policy No.:

I undertake to appoint, where required, suitable competent persons, in writing, in terms of the requirements of
OHSA and the Regulations and to charge him/them with the duty of ensuring that the provisions of OHSA and
Regulations as well as the Council's Special Conditions of Contract, Way Leave, Lock-Out and Work Permit
Procedures are adhered to as far as reasonably practicable.

I further undertake to ensure that any subcontractors employed by me will enter into an occupational health and
safety agreement separately, and that such subcontractors comply with the conditions set.

I hereby declare that I have read and understand the appended Occupational Health and Safety Conditions and
undertake to comply therewith at all times.

I hereby also undertake to comply with the Occupational Health and Safety Specification and Plan.

Signed aton the.....day of.....20....

Witness

Mandatory

Signed at on the.....day of.....20

Witness

**for and on behalf of
NAMA-KHOI MUNICIPALITY**

OCCUPATIONAL HEALTH AND SAFETY CONDITIONS

1. The Chief Executive Officer of the Contractor shall assume the responsibility in terms of Section 16(1) of the Occupational Health and Safety Act (as amended). Should the Contractor assign any duty in terms of Section 16(2), a copy of such assignment shall immediately be provided to the representative of the Employer as defined in the Contract.
2. All work performed on the Employer's premises shall be performed under the supervision of the construction supervisor who understand the hazards associated with any work that the Contractor performs on the site in terms of Construction Regulations 2003.
3. The Contractor shall appoint a Competent Person who shall be trained on any occupational health and safety aspect pertaining to them or to the work that is to be performed.
4. The Contractor shall ensure that he familiarises himself with the requirements of the Occupational Health and Safety Act and that he, his employees, and any sub-contractors, comply with them.
5. Discipline in the interests of occupational health and safety shall be strictly enforced.
6. Personal protective equipment shall be issued by the Contractor as required and shall be worn at all times where necessary.
7. Written safe work procedures and appropriate precautionary measures shall be available and enforced, and all employees shall be made conversant with the contents of these practices.
8. No substandard equipment/machinery/articles or substances shall be used on the site.
9. All incidents referred to in terms of Section 24 of the Occupational Health and Safety Act shall be reported by the Contractor to the Department of Labour and the Employer.
10. The Employer hereby obtains an interest in the issue of any formal inquiry conducted in terms of Section 32 of the Occupational Health and Safety Act and into any incident involving a Contractor and/or his employees and/or his sub-contractor/s.
11. No use shall be made of any of the Employer's machinery/plant/equipment/substance/personal protective equipment or any other article without prior arrangement and written approval.
12. No alcohol or any other intoxicating substance shall be allowed on the site. Any person suspected of being under the influence of alcohol or any other intoxicating substance shall not be permitted access to, or allowed to remain on the site.
13. Prior to commencement of any work, verified copies of all documents mentioned in the agreement, must be presented to the Employer.

Part C2: Pricing Data

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C2.2 Bills of Quantities	96 –107
C2.3 Declaration	108

NAMA-KHOI MUNICIPALITY

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REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

C2.1 Pricing Assumptions

Pricing Assumptions mean the criteria as set out below, read together with all Parts of this contract document, which it will be assumed in the contract, that the tenderer has taken into account when developing his prices.

1. This Bill of Quantities has to be read together with the Articles of the Agreement, the Conditions of Contract and Special Conditions of Contract, the Form of Tender, the General Specification, the Project Specification and the Drawings.
2. The method of measurement published by the South African Bureau of Standards in clause 8 of the Standardised Specifications for Civil Engineering Construction is applicable, subject to the variations and amendments contained in the section "Applicable SANS 1200 standardised specifications".
3. General instruction and description of the Work or materials given in the Specification will not be repeated in the Bill of Quantities. It will only be referred to. Doorbell of reference between brackets, to particular Clause in the Conditions of Contract(C-22) or, Special Conditions of Contract(SC-11), General Specification(19.1.3), Project Specification(PS 11) or to a Drawing (Drawing 33650.01-141-01).
4. The clauses in a specification in which further information regarding the schedule item appears under "Reference clause" in the Schedule. The reference clauses indicated are not necessarily the only sources of information in respect of scheduled items. Further information and specifications may be found elsewhere in the contract documents. Standardised Specifications are identified by the letter or letters which follow SANS in the SANS 1200 series of specifications, eg. G for SANS 1200 G.
5. The quantities set out in the Bills of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Engineer from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.
6. The prices and unit prices given in the Bill of Quantities, are all-embracing prices and it should cover the values of the different items completely and has to include all costs and expenses which may occur and for the building of the Work as described and costs and expenses that are required as well as all general liabilities, obligations and risks which forms a part of this contract. The prices should be given separate in the item(s) if special accountability, responsibilities and risks as in the above occurs.
7. A price or unit price has to be filled in against every item in the Bill of Quantities even if the amount isn't shown. Items where no price or unit price has been filled in, will be regarded as covered by the other prices and unit prices in the Bill of Quantities. VAT must no be included in the tariff's.
8. Unit rates would be regarded as correctly if any difference occurs between unit prices and the total and the total will be corrected according to. The unit prices will be calculated arithmetical in case of omissions.
9. Payments will only be made for items occurring in the Bill of Quantities and if the Contractor thinks that provision hasn't been made for some items, the item should be allowed under another item.
10. Except where rates only are required, insert all amounts to be included in the total tendered price in the "Amount" column and show the corresponding total tendered price.

11. The units of measurement described in the Bills of Quantities are metric units. Abbreviations which may be used in these Bills of Quantities are as follows:

mm	=	millimetre	h	=	hour
m	=	metre	kg	=	kilogram
km	=	kilometre	t	=	ton (1000 kg)
m ²	=	square metre	No.	=	number
m ² .pass	=	square metre-pass	sum	=	lump sum
ha	=	hectare	MN	=	meganeutron
m ³	=	cubic metre	MN.m	=	meganeutron-metre
m ³ .km	=	cubic metre-kilometre	P C sum	=	Prime Cost sum
l	=	litre	Prov sum	=	Provisional sum
kl	=	kilolitre	kW	=	kilowatt
kl	=	kilolitre	%	=	per cent
MI	=	megalitre			
MPa	=	megapascal			

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

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C2.2 Bills of Quantities

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BILL NO. A: PRELIMINARY AND GENERAL	98 – 99
BILL NO. C: CIVIL WORKS	100 – 101
BILL NO. M: MECHANICAL WORKS	102
BILL NO. 4: ELECTRICAL WORKS	103 – 107
DECLARATION	108

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<u>SUMMARY</u>		Page No.		Amount	
				R	c
A	PRELIMINARY AND GENERAL	98-99			
C	CIVIL WORKS	100-101			
M	MECHANICAL WORKS	102			
E	ELECTRICAL WORKS	103-107			
SUB-TOTAL		R			
* <u>CONTINGENCIES</u>					
Allow the sum of 12,5% (twelvepoint five percent) of the above Sub-total for Contingencies to be spent as the Engineer may direct and to be deducted in whole or in part if not required.			R		
TOTAL INCLUDING CONTINGENCIES			R		
<u>VALUE ADDED TAX</u>					
ADD: VAT at the rate of 15%			R		
TOTAL Carried to part C1.1 Form of Offer and Acceptance					
			R		
CONTRACT PERIOD :.....WEEKS					
* Amount allowed for the use of the Engineer only.					

NAMA-KHOI MUNICIPALITY

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C2.3 DECLARATION (In respect of completeness of Tender)

Nama-Khoi Municipality
PO BOX 17
SPRINGBOK
8240

I/we, the undersigned, do hereby declare that these are the properly priced Bills of Quantities forming part C2.2 of this Contract Document containing 367 pages in consecutive order upon which my/our tender for **BID NO. NC062 / 03/2023/2023 : REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS** has been based.

SIGNATURE OF TENDERER/S

DATE

Part C3: Scope of Work

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Status

Should any requirement or provision in the parts of the Scope of Work conflict with any requirement of any Standardised Specification, particular specification or any drawings, the order of precedence, unless otherwise specified, is:

Drawings
Scope of Work (Parts C3.1, C3.4 C3.5 and C3.6)
SANS Standardised Specifications

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

C3.1 Description of the Works

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C3.1 Description of the Works

C3.1.1 General

The NAMA-KHOI MUNICIPALITY proposes to refurbish its wastewater infrastructure in NababEEP to a functional condition. This wastewater treatment plant was originally constructed in 1962 by the Okiep Copper Company, who owned and operated most of the copper mines in the Springbok area. The last copper mines closed down in 2007, and the wastewater treatment plant was then transferred to the Nama-Khoi Municipality, who was tasked with administrating the town of NababEEP since then.

C3.1.2 Scope of Contract

The works entails the following

- Construction of a new reinforced concrete structure to accommodate two Archimedes Screw Lifting Pumps
- Construction of a new reinforced concrete above-ground Inlet works, comprising hand-raked screens, grit channels and a flow measuring facility.
- Demolition of existing primary pump station top structure and refurbishment of two self-priming lift pumps complete with piping and switchgear.
- Refurbishment of several reinforced concrete structures such as Clarigesters, Biological Filter basins, Clarifiers, etc. (crack repairs, sealing, etc)
- Refurbishment of Mechanical equipment on Clarigesters such as scraper reduction gearboxes, scrapers, flame arrestors and sludge pumps.
- Refurbishment of Mechanical equipment on Biological Filtration Units such as central rotating distributors, replacement of stone media, etc.
- Refurbishment of Mechanical equipment on Clarifiers such as scraper reduction gearboxes, scrapers and sludge pumps.
- Replacement of Chemical Dosing system for Chlorine dosing using a Calcium Hypochlorite solution
- Replacement of the Treated Effluent Pressure Filters and discharge pump station.
- Convert the current 520V Electrical power supply system to a 400V 3-phase electrical system.
- Replacement of all Electrical switchgear for pumps, geraed motors, etc complete with cables, eathing, site lighting, etc.

C3.1.3 Description of the site and access

NababEEP village is 19km northwest of Springbok, just off the N7 national route between Cape Town and the Namibian border at Vioolsdrift. The town's elevation is approximately 815m above mean sea level, and is positioned in a

rocky valley, with mountainous terrain radiating outwards in all directions. The town is located in quaternary catchment F30E.

The Nababeep WWTP is reached by following the Main Road into the CBD, then keeping left at the fork, and crossing the Schaap River bridge. Just after the bridge is a gravel road heading north, follow this road for approximately 1km, the site is found on the left.

C3.1.4 Description of the Nababeep WWTP

The Nababeep WWTP is in excess of 60 years old, and utilizes biological filtration or fixed-film attached growth reactors as secondary treatment process.

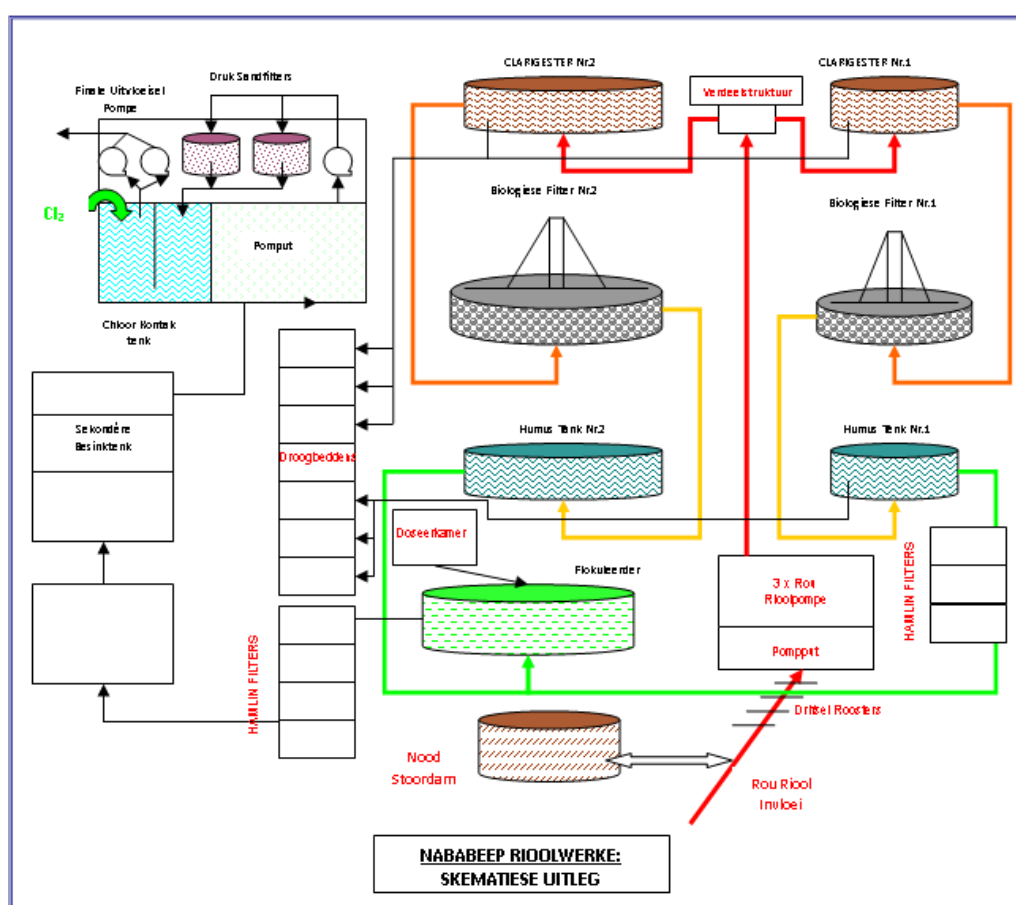
Primary Treatment

Raw sewage enters a submerged Inlet Chamber from a 300mm dia uPVC main sewer. The Inlet Chamber is currently equipped with a single hand-raked screen located approximately 2.80m below Normal Ground Level.

Screened sewage then flows under gravity to the Raw Sewage Pump Sump, from where the wastewater is then pumped with two number Gorman-Rupp self-priming pumps to a splitter box.

Splitter Box

Nababeep WWTP is equipped with two parallel, but similar, process trains differing in size of the unit processes. The splitter box splits the incoming flow in a 40% : 60% ratio to each of the Clarigester units.



Clarigesters

A Clarigester is essentially a combination of a Primary Settling Tank with double vertical chambers, the top chamber being open to atmosphere. Wastewater from the splitter box enters the unit through a central inlet pipe in the centre of the tank.

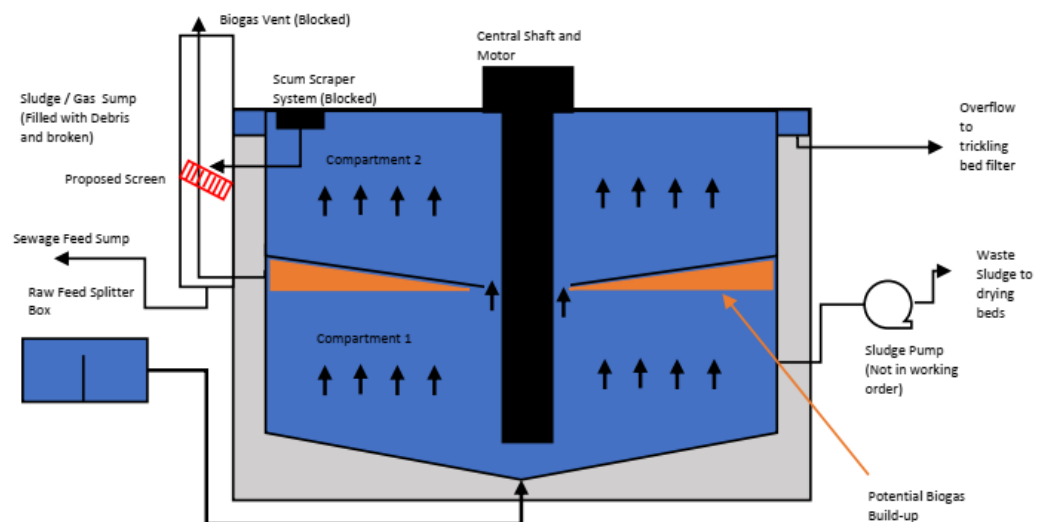
The upper chamber serves as a Primary Settling Tank, where all settleable solids settle out under gravity, and the supernatant is allowed to flow over the circumferential weir. The unit is equipped with an electrically powered reduction gearbox driving a mechanical scraper, which scrapes the settled sludge through an opening in the floor of the top chamber.

The sludge then passes into the second chamber, which acts as an anaerobic digester to digest the raw sludge. The scraper's central shaft passes through the upper floor, and has a second scraper below, which agitates the sludge and ensures good contact with the anaerobic bacteria which digests the sludge.



The upper floor is sloped towards the center of the tank, which creates space in the upper circumference, where gas such as methane (CH_4), Hydrogen Sulphide (H_2S) and Carbon Dioxide (CO_2), which are the byproducts of anaerobic digestion, accumulate.

The lower tank is also equipped with a vertical concrete shaft on the perimeter of the tank, where the gas vents to atmosphere through a flame arrestor. This is required as methane, combined with oxygen is extremely flammable at low concentrations.



A further outlet is provided from where digested sludge can be removed using a self-priming Gorman-Rupp pump, which withdraws the sludge and pumps it to the Drying Beds for dewatering.

Nababeep has one 9m diameter Clarigester and one 12m diameter Clarigester.

Biological Filters

A biological filter (Biofilter) treats wastewater which has been settled in a primary sedimentation tank (PST) or a septic tank, and comprises a bed of stone media, contained within a circular concrete tank structure. Nababeep WWTP is fitted with one 12m diameter biofilter and one 20m diameter biofilter with bed depths of approximately 2.50m each.

The supernatant from each Clarigester flowing over the circumferential weir, is collected in a concrete launder, and diverted to the biological filters under gravity flow. The water enters the biological filter in the center of the tank through a vertical pipe, which is fitted with a rotary distributor.

The distributor is fitted with two pipes equipped with nozzles, which serve to spread the water across the stone media evenly when the distributor rotates about its own axis. Rotary movement is affected by the water discharged from the distributor nozzles exerting a force on the surface of the stone media. This action essentially "pushes" the distributor pipe, causing circular motion.

The Settled Sewage is sprayed or trickled over the top surface of the stone media bed, through which it percolates downwards under gravity. A slime layer, containing a large number of micro-organisms, forms on the surface of the stone media.



As the sewage flows over this slime, a series of complex bio-chemical reactions take place, by which organic material is assimilated by the organisms as food, and removed from the water.

The media bed is aerated either by natural draft or by forced ventilation to provide oxygen to the purification process. The aeration or addition of oxygen also affects "Nitrification", which is the process where Ammonia (NH_4), is converted to Nitrates (NO_2) and Nitrites (NO_3).

As long as the micro-organisms receive a source of food in the presence of oxygen, they multiply, but they also die off. The downward flow of water then washes off the dead and decaying bacterial biomass, and flows out of the biofilter with the water. This is known as Humus.

Clarifiers/Humus Tanks

Clarifiers, Humus Tanks or Secondary Settling Tanks, all serve the same purpose, that is to separate the humus from the water stream coming from the Biofilters. This is achieved by means of settling under gravity.

The humus stream from the biofilters, enters each Clarifier through its centre column, where the solids or bacterial mass settle, while the water flows radially outwards to exit the tank over the circumferential weir.

The settled humus is allowed to thicken, and is then removed by means of a an electrically powered reduction gearbox driving a mechanical scraper, which scrapes the settled sludge into a hopper in the floor of the Clarifier.

From the hopper, the sludge/humus is returned to the Raw Sewage Pump Sump. The water from the biofilters contains Nitrates and Nitrites, which, when introduced into the anaerobic conditions of the Raw Sewage Pump Sump, causes the bacteria to utilize the oxygen molecules, and release the Nitrogen molecules as a gas to atmosphere. This mechanism is known as "Denitrification" and is utilized to remove the nitrogen from the water.



The clarified water flowing over the weir, is collected in a launder, and then transferred to the Flocculation Tank, where it used to be dosed with Aluminium Sulphate, which serves to trap the phosphates in the settled sludge.

Hamlin Filters

Hamlin Filters are essentially slow sand filters with the ability to backwash by means of reverse flow through the filter media. These filters have been abandoned for many years and no longer operational. Any work on them will be pending the availability of funds on the contract.

Retention Tank

The original process design dictated that the water treated by the Hamlin Filters was pumped to the Retention Tank, from where it flowed to the Chlorine Contact Tank for disinfection. Similar to the Hamlin Filters, the Retention Tank has been decommissioned for many years, and will only be repaired if funding is available.

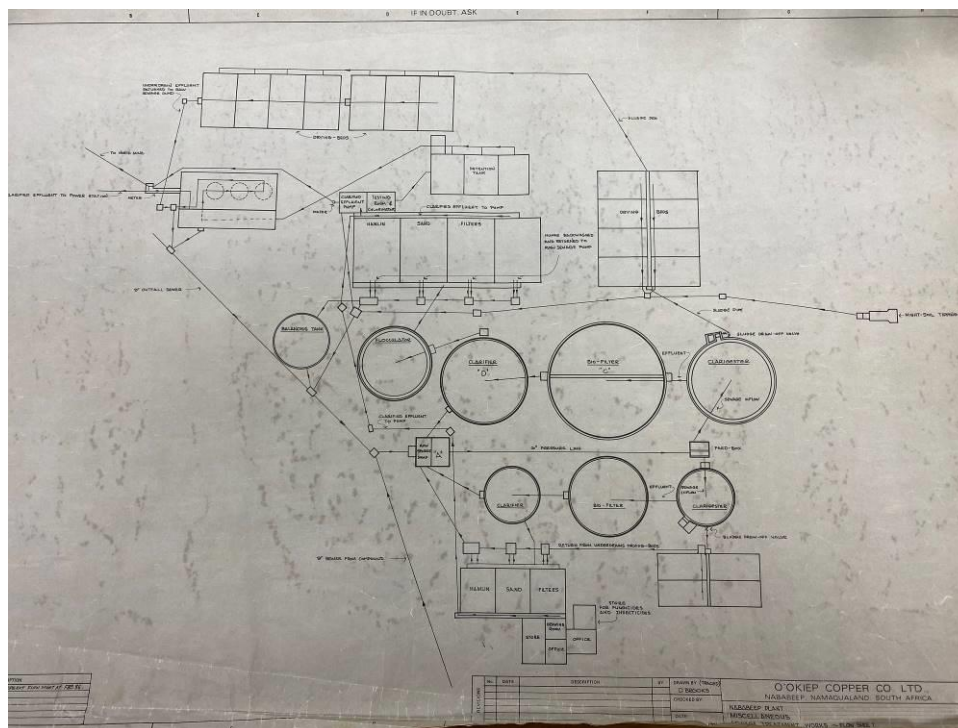
Chlorine Contact Tank

This is a rectangular reinforced concrete tank of approximately 9m x 15m, which serves to provide sufficient contact time for disinfection to take place. This tank also serves as the source of water for the Final Effluent Pumps, which abstract water from this tank, and pumped it through a set of Pressure Sand Filters prior to discharging the Treated Effluent to the Schaap River, located across the road from the Nababeep WWTP.



Purpose of the Works for this contract

The purpose of the works for this contract will be to add new infrastructure at the Inlet Works, and to repair and/or modify the existing infrastructure to render the Nababeep WWTP a functional wastewater treatment plant on completion. This has the intention of delivering a Treated Effluent which will comply with the General Limit values on a continuous basis.



Original Layout of the Nababeep WWTP

C3.1.5

Details of the Contract

C3.1.5.1

Addition of an Archimedes Screw Pump Lifting Station

- Contractor to block off sewage flow at manhole prior to Inlet Chamber.
- Install a temporary submersible pump of suitable size and bypass flow from the manhole to the Raw Sewage Sump for the duration of the works.
- Break out an opening of 2 300mm x 3 500mm in the West wall of the Inlet Chamber, expose rebar and make good.
- Excavate in all materials to create space for the screw pump station structure, with a floor at an angle of 35°
- Construction of a new Reinforced concrete structure to accommodate two number 400mm dia Archimedes Screw Pumps on completion as per drawing No. 35008.00-140-01.
- Contractor to manufacture, deliver, install and commission two number Arcimedes Screw Pumps for pumping of raw sewage from the Inlet Chamber to the new above ground Inlet Works.
- Each Archimedean Screw Pump to have a flow of **18 liters per second at a total head of 4.00m.**

Number of Pumps:	2
d/D Ratio	> 0.6 (shaft dia to helix dia ratio)
Inclination of pumps:	35°
Ovality tolerance:	± 1.50mm
Pitch tolerance:	± 5.0mm

- Screw pump bodies to be fabricated from longitudinally or spirally wound Mild Steel steel tubes with flights formed from rolled steel plate.
- The fabricated mild steel shall be thoroughly cleaned after manufacture, **sandblasted to SA 2½, then coated with a suitable Zinc Primer to a DFT of at least 50µm. This is to be followed by 2 coats of Epoxy Coating such as Carboline Carboguard 893 or similar to a DFT of 150µm per coat.**
- Each Archimedes Screw Pump to be supported by a “sealed for life” lower ECO bearing securely mounted to the concrete floor of the Inlet Chamber with a minimum of 6 x M20 Gr.304 Stainless Steel Chemical Anchors.

- Bearings shall be sized for a life of 30 000 hours at a B10 rating. Bearings to be capable of accommodating the radial and thrust loads at maximum discharge.
- ***A written guarantee for a minimum life cycle of 3 years at full load will be required for the lower pump bearings.***
- The drive end of the Screw Pump will be fitted with a suitably sized reduction gearbox to provide maximum 80 to 120 RPM rotation and be driven by a V-Belt from a suitably sized 400V 3-phase electrical motor.
- The upper drive assembly, consisting of electrical motor, reduction gearbox and coupling will be securely mounted on a steel baseplate fixed to concrete pedestal as indicated. Gearbox to have a Power Service Factor of at least 1.75. (SEW Eurodrive or similar)
- The standard drive arrangement consists of a 3-phase 400V electric motor driving through suitably sized pulleys and vee-belts to the input shaft of a right or left angle bevel helical reduction gearbox, which is connected in turn to the screw pump upper bearing shaft through a suitable flexible coupling. (Flender or similar)
- A reverse rotation brake must be fitted to the motor shaft to prevent the weight of water in the flights rotating the screw backwards when the drive stops.
- After completion of installation of the screw and grouting of the bearings and drive baseplates, the required trough diameter is obtained by rotating the screw by hand, with a temporary screed bar fitted to the flights, and applying a concrete screed until the correct trough profile has been achieved. Tolerance should not exceed 20mm anywhere between the flights and the concrete screed. Screed to be neatly finished off true to line and level on completion.
- Supply and installation of an Epoxy coated mild steel side profile splash plate for each screw pump, complete with fasteners.
- ***Contractor to supply the following spares with the pumps:***
 - 2 x Spare lower bearing - complete with pedestal as specified
 - 2 x Spare flexible coupling – complete with flanges to fit pump shaft and gearbox shaft
- The Contractor to commission the pumps on completion of the installation to the satisfaction of the Engineer.

C3.1.5.2 Construction of a new above-ground Inlet works

- Construction of RC concrete inlet works comprising a dual hand-raked screen, dual grit removal channels and a Parshall Flume for flow measurement. This structure also includes a bypass pipe and draining valves and pipework.
- Each Hand-raked screen shall comprise 22 number 40mm x 6mm Galvanized Mild Steel Flat Bars at a 15mm spacing across a 450mm wide concrete channel.
- Screen to be at 30° to 45° off the horizontal floor and securely fixed with a 10mm x 150mm Toe Plate to the channel floor and the top of the canal walls.
- Each screen also to be fitted with an Aluminium Handstop with dimensions of 500mm high x 450mm wide complete with frame in order to isolate a single channel for maintenance purposes.
- Aluminium Handstops to be fitted with an “L” type seal to render the handstop drop tight when closed.
- Downstream of each hand-raked screen, a grit channel with dimensions of 500mm x 450mm wide x 9000mm long is to be constructed. Each channel to have a floor recess 100mm deep and 150mm wide.
- Each channel is to be provided with a benching on either side to approximate a parabolic cross section at low flows.
- Each channel is to be provided with an outlet pipe complete with 75mm dia valve to facilitate drainage of the water from the channel to allow the grit to be removed.
- Each channel outlet is to be provided with a small piece (250mm x 250mm) Gr.304 SS Medium Weave Mesh over the outlet pipe. This is to retain any grit from flowing out when the channel is drained.
- Each grit channel shall also be equipped with a downstream Aluminium Handstop with dimensions of 500mm high x 450mm wide complete with frame in order to isolate a single channel for grit removal purposes.
- Downstream of the Grit Channels, a prefabricated Gr 316 Stainless Steel Parshall Flume with a throat width of 3” or 76.2mm, is to be cast neatly into the channel provided complete with an engraved upstream gauge plate mounted to the vertical wall.

- All concrete to have a Smooth off shutter finish with all edges provided with a 20mm x 20mm chamfered finish.
- All concrete to be 30Mpa with 19mm stone. Contractors to provide a mix design to the Engineer for approval before any concrete is cast.
- All joints to be fitted with a suitable horizontal as well as vertical waterstop as indicated.
- Where indicated on the drawings, Galvanized Metal Handrailing will be securely fixed using, either Stainless Steel chemical anchors, or Stainless-Steel sleeve-anchors. Rawl bolts will not be accepted as fixing method.
- A 300mm dia uPVC Bypass Pipe will be fitted from upstream of the hand raked screens to the downstream outlet. This is to facilitate flow to bypass the Inlet Structure should the screens become so clogged that the structure wants to overflow.
- The Parshall Flume shall be fitted with an ultrasonic level sensor suitable for measuring open channel flow, and both instantaneous flow (in liters per second) as well as cumulative flow (cubic meters). The E+H Prosonic S FMU90 transmitter with a FDU90 ultrasonic sensor is preferred.
- All measured flowdata shall be logged on a dedicated Simex Multicon CMC 99 Datalogger to be installed adjacent to the Ultrasonic Flow Meter. Data is to be logged at 15 second intervals.
- The instantaneous flow shall be displayed on the Multicon screen as a continuous line graph as default view.
- Both the ultrasonic flow meter as well as the datalogger shall be fitted with an Uninterruptable Power Supply, capable of keeping the measuring system operational for at least 8 hours in case of a power failure.

C 3.1.5.3 Demolition of existing Raw Sewage Sump Station top structure

The existing brick masonry Primary Pump Station building is constructed of brick masonry and has been haphazardously added to over the years.

This building houses the old subsurface pump room, very old electrical switchgear and some ablution facilities in very poor state. The subsurface pump room is currently submerged with water. The building is also small and cramped and not conducive to further use.

Subsequently the following actions are required:

- Strip out the existing ventilation draught tube, fan and supporting elements complete and remove to spoil.
- Strip out old mild steel gantry frame and remove to spoil.
- Strip out all old handrailing, open grid flooring, sump baskets, screens, etc and remove to spoil.
- Supply and install temporary covers to sump openings to render the area safe to work in, and to prevent any debris from falling into the sump.
- Pump out water from the old dry well pump room, and strip out pumps, motors, valves, pipework, steel staircase and any debris remaining to spoil.
- Fit permanent blank flanges to suction piping passing through walls to the wet sump and render it fully waterproof. If pipework through wall as deteriorated to a point where it is not reparable, remove pipework and caulk openings with suitable non-shrink grout to obtain a water tight repair.
- Isolate the electrical supply to the Pump House building and render it safe for removal of old switchgear. Ensure supply is permanently locked out before commencing any works on electrical equipment.
- Strip out and remove all old 525V switchgear, cabling, cable racks, Motor Control Centres, light switches, light fittings and remove to spoil.
- Temporarily remove 2 number Gorman-Rupp self-priming pumps complete with baseplates, motors and switchgear and place in temporary storage.
- Strip off all "Big 6" corrugated fiber cement side and roof cladding and remove to spoil.
- Strip off all timber roof structures and remove to spoil.
- Demolish the entire brick masonry superstructure above the Inlet Sump inclusive of the flat-roofed additions on either side.
- Once Contractor has confirmed that the old Dry Sump has been rendered waterproof, and no leakage is taking place from the adjacent wet well, the old dry well will be backfilled with a G6 material to be placed in layers of 300mm thick and compacted to 98% MOD AASHTO density until it has been filled to floor level. On completion, the area is to be covered with a 100mm thick reinforced concrete slab finished flush with the existing floor slabs.

- On completion, only the cover slab of the Inlet Sump and existing floors are to remain for future installation of the 2 Gorman-Rupp Pumps and their switchgear.

C3 .1.5.4 Construction of a new Raw Sewage Pump House for the Inlet Sump

- Contractor to manufacture, supply and erect a new steel portal frame structure over the existing Inlet Sump floorslab with dimensions of 7.50m x 5.50m complete with White Chromadek bullnose side cladding and roof cladding.
- Construction of new brick masonry walls, face brick inside and outside as per drawing complete with 2.50m x 2.50m roller shutter access door and pedestrian doors and Ventilation Louvres.
- Construction of a new cable inlet canal for the Motor Control Centre electrical power supply.
- Supply, deliver and installation of Galvanized Mild Steel hinged covers for all acces manholes to the pump sump.
- Construction of two new mass concrete pump plinths for the repaired Gorman-Rupp self-priming pumps.
- Refurbish all concrete floors to a neat and tidy finish.
- Modify existing internal pipework and reconnect to existing rising main outside of new building.
- Connect pumps to electrical supply and commission.

C3.1.5.5 Refurbishment of two Raw Sewage self-priming lift pumps complete with piping and switchgear.

- Contractor to strip and repair 2 number existing Gorman-Rupp T4 self-priming pumps inclusive of bearings, mechanical seals, flap-valves and replacement of oil.
- Contractor to check alignment and V-belts on drive end and replace if worn.
- Service and check operation of de-aeration valve, non-return valve and isolating valve on delivery side.
- Install 2 number complete pumps on new concrete pump plinths and fix baseplates securely with M16 chemical anchors.
- Reinstall suction piping through building wall and sump cover slab to wiwthin 300mm of sump floor.

- Modify existing delivery pipework and reconnect to existing rising main outside of new building.
- Manufacture, deliver and install new Motor Control Center for the two Raw Sewage Pumps.
- Connect pumps to electrical supply and commission.

C3.1.5.6 Repair and refurbishment of reinforced concrete structural defects on Clarigesters, Biological Filter basins, Clarifiers, etc. (crack repairs, sealing, etc)

NababEEP WWTP is fitted with several reinforced concrete structures in excess of 60 years old and their concrete has several incidences of spalling, where the rebar is completely exposed. The concrete at several structures also shows severe signs of concrete corrosion which will need to be repaired.

Similar defects are also present on the concrete bridges constructed across the clarigesters and clarifiers, where spalling and exposed steel are visible. The one biofilter has a severe crack which must also be repaired. The following is required in terms of concrete repairs:

- Contractor to empty all liquid out of the structure into the adjacent unit right down to floor level.
- Contractor to remove all sludge from both top and bottom compartments where applicable, either by diluting it to a degree where it is liquid enough to pump, or by hand. Removed sludge to be disposed of in the plant drying beds for solar drying.
- As the lower compartment in the Clarigesters are anaerobic in nature, and a confined space, special care should be taken before any person enters these compartments.

Anaerobic conditions lead to the presence of Hydrogen Sulphide gas, Methane gas and Carbon Dioxide gas. All these gasses are noxious when breathed. Besides being noxious, Methane, in the presence of Oxygen, is highly flammable and explosive.

- **Contractors are to provide and maintain as a minimum a calibrated Multi-Gas Detector on site operated by a competent person. Before any person is allowed to access areas where**

Anaerobic processes occur, the area shall be tested and declared safe. Comprehensive records of these tests shall be kept for the duration of the contract.

- Before any works take place within areas where Anaerobic processes occur, the Contractor shall provide portable fans and temporary ducts to affect positive air ventilation into such areas at a rate ensuring at least 10 volumetric air changes per hour. Contractor will prove scientifically, that such positive ventilation is taking place before any works in such areas may commence.**
- On removal of all liquids and sludge from these compartments, all internal concrete will be washed clean with a high-pressure water jet and then inspected for cracks and or concrete corrosion.
- Severe cracks (> 2mm in width) shall be repaired using a suitable cementitious mortar (SIKA Monotop or similar), and then sealed off with a suitable sealant (SIKAGARD-63N or similar).
- Areas where concrete corrosion have occurred, will be scrubbed to remove all loose material and laitance. Area is then to be prepared and repaired with a suitable epoxy mortar (SIKA Monotop or similar).
- Areas which have spalled and where rebar is visible shall be suitably repaired and made good to be functional and to avoid further deterioration and corrosion taking place.
- Typical areas which require attention will be the overflow launders on the circumference of the Clarigestors, the concrete shafts which connect the anaerobic chamber with the atmosphere, and the concrete bridges across the clarigesters, which bear the mechanical equipment.
- An allowance has been made in the Bill of Quantities for an estimated area for each of the Clarigestors, Biofilter Basins and Clarifiers for such repairs. With the exception of the Biofilters, the prescribed process will be similar to that described above.

C 3.1.5.7 Refurbishment of Clarigesters (Mechanical)

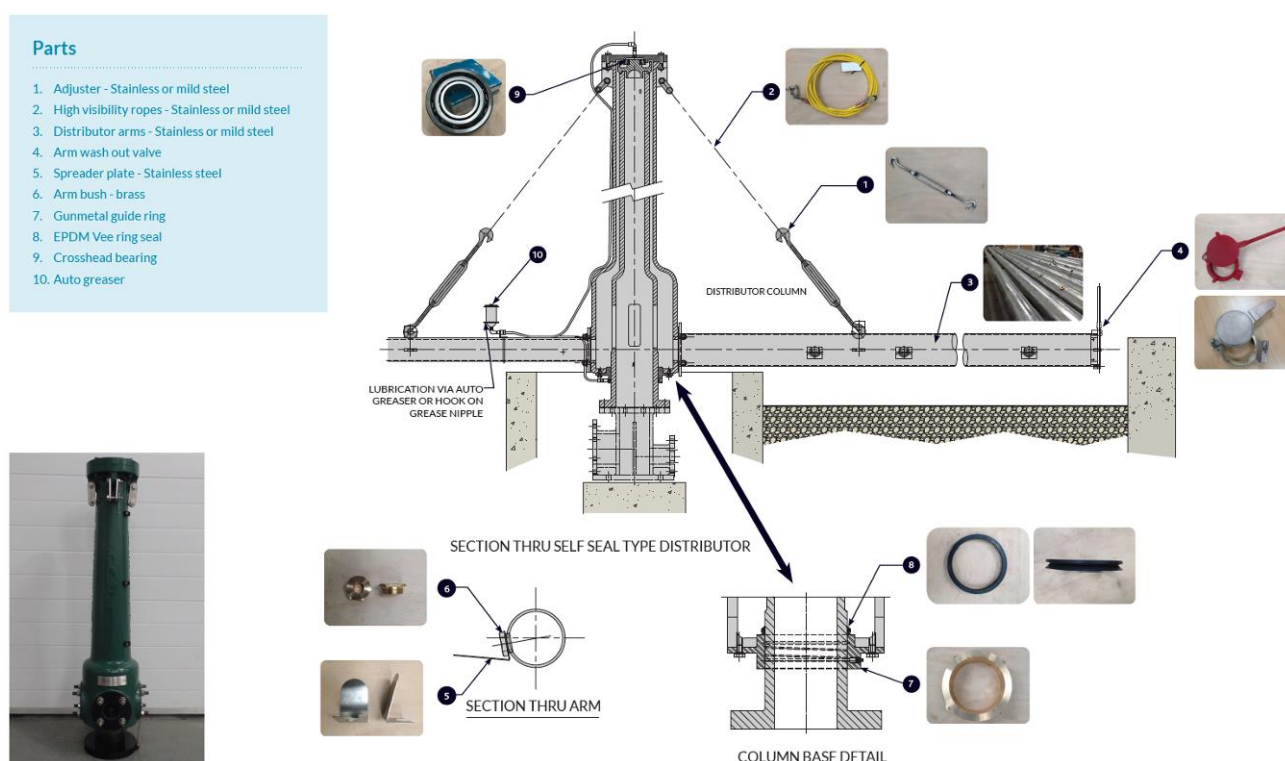
- Each Clarigester is fitted with a heavy-duty worm and wheel gearbox powered by an electrical motor via a V-belt and pulleys. This gearbox drives mechanical scrapers in both the upper and lower compartments of the tank by means of a centrally located vertical shaft.
- Contractor will strip the assembly, and remove the gearbox for refurbishment. This will include stripping the gearbox, replacing bearings, oil seals and any broken or defective internal parts, reassembly, replacing oil and grease and refitting the gearbox back in its original position. **No leakage of oil will be acceptable after refurbishment of these units.**
- The central shaft and scraper assembly's will be inspected for mechanical damage, rust and corrosion.
- Structural repairs will be affected by welding in replacement steel sections where required and then grit blasting to SA2½.
- Structure will then be repainted with a suitable coating such as Carboline Carboguard 193 or similar to at least 200µm DFT.
- Scrapers will be properly aligned and secured to ensure smooth rotational movement around the centre column.
- All floor scrapers to be fitted with 500mm x 70mm x 10mm thick nitrile rubber leading edges in full contact with the concrete floor.
- Concrete shaft connecting the lower anaerobic compartment to atmosphere, will be repaired to its original state where damaged.
- The Contractor will manufacture, supply, install and commission a new galvanized mild steel cover for this shaft, complete with 100mm dia vent pipe fitted with:
 - A suitable Flame Arrestor (Elmac Technologies inline type)
 - A suitable Pressure Relief and Vacuum Relief Valve (Elmac)to ensure safe future operation of the anaerobic digestion chamber below.
- Each of the Clarigestors is also equipped with a Gorman-Rupp sludge pump used for withdrawing digested sludge from the lower anaerobic compartment of the Clarigester, and pumping the sludge to the drying beds. These pumps need to be fully cleaned and refurbished inclusive of bearings, mechanical seals, flap-valves, etc to be reinstated to full working condition.

- Proposals for improving the suction side pipeworks for these sludge pumps must be made, as the existing arrangement is not satisfactory.
- Supply and install piping, fittings and valves to allow the Sludge Pump to circulate the Clarigester anaerobic tank contents.
- Existing HDPE Sludge Pipes are located above ground, and must be properly layed in an excavated trench with at least 500mm of cover.
- On completion, the Clarigester must be in good operational condition and all mechanical equipment must be fully operational before being re-commissioned

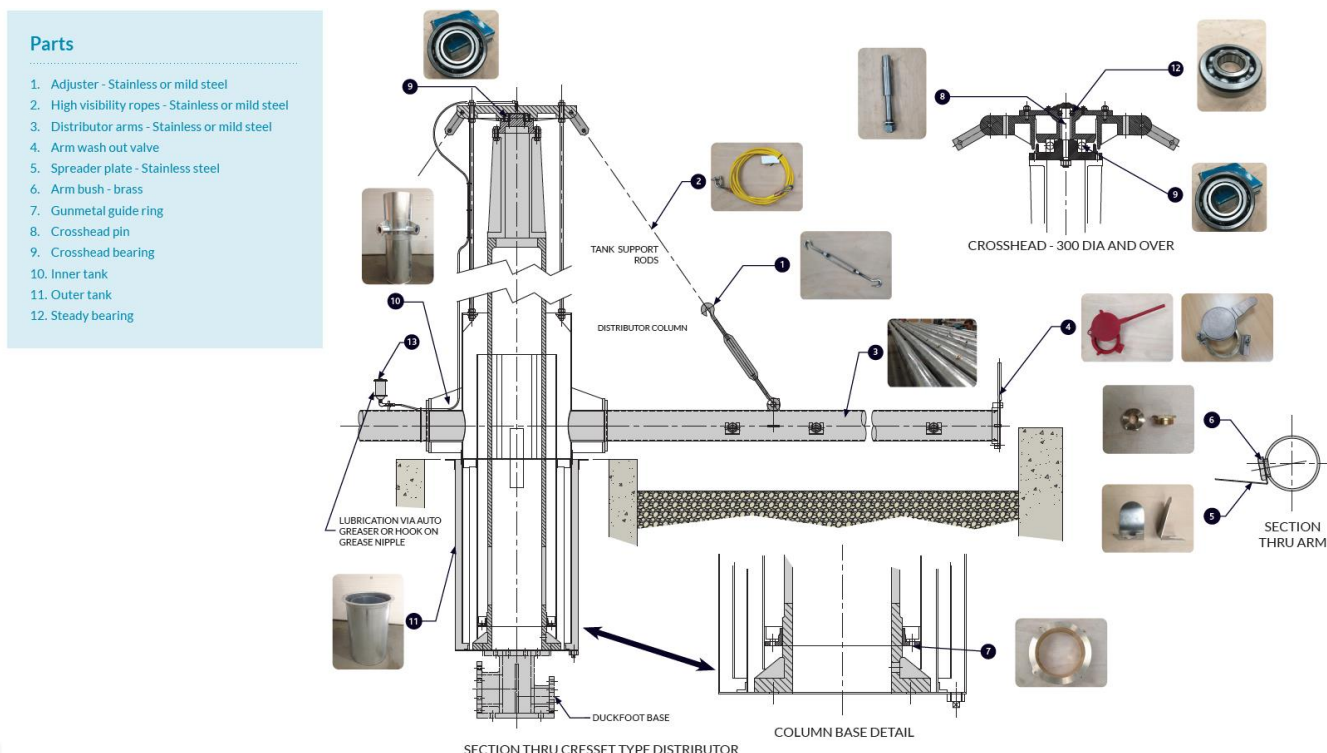
C3.1.5.8 Refurbishment of Mechanical equipment on Biological Filtration Units

The Nababeep WWTP is equipped with two number conventional biological filters. The first unit has a diameter of 12m and an approximate bed depth of 2.50m. The second unit has a diameter of 20m and an estimated bed depth of 3.0m. Each unit is fitted with a centrally mounted inlet pipe, from where a rotating distributor serves to spread the settled wastewater over the stone media.

The 12m unit is equipped with a Self-seal distributor originally manufactured by Adams Hydraulics in the UK. It comprises of a centre column with arms suspended from the crosshead and sealed from below with a V-lip seal around the guide ring. The cross head contains a bearing for smooth rotation.



The 20m unit is equipped with a Cresset Type distributor, which was also manufactured in the UK by Adams Hydraulics. It comprises of an inner and outer tank suspended from a top bearing and includes weir arms for distributing the water.



Both these units have only two distribution pipes located 180° apart, supported with cable stays from the central crosshead. Each distribution pipe is equipped with nozzles along its length spaced to ensure even distribution of the water over the stone media. Each pipe is also fitted with a Wash-out Valve at its end, to clear any blockages or debris that may have passed into the system.

The stone media is supported by a layer of drainage bricks on the floor or each tank, from where the treated water and humus is collected and discharged at a floor level outlet.

The distributors of both these biofilters are seriously blocked, leaking and worn out.

Therefore, the following actions will be required:

- Contractor to remove the distribution pipes from the centre column. Clean out and repair any damage to pipes caused by dragging on the

stone media. Each distribution pipe will be fitted with a new Wash-out valve on its end.

- Contractor to remove the center column, strip it completely and replace the bearings, guide- and wear rings and seals required to return it to fully functional status.
- Contractor to remove all stone media inside of each biofilter and spoil said material on site.
- Inspection of entire area of floor drainage bricks and replace any faulty or broken units with similar.
- Clean the inner concrete surface of the biofilter tank with a high-pressure water washing unit to expose any deteriorating concrete.
- Repair of cracks, corroded concrete and any spalling as per Item 3.1.5.6 procedure.
- Centre feedpipe to be cleaned out all the way from Clarigester launder outlet to biofilter inlet using a hydroblast high-pressure washer to ensure pipes are clean and free from any debris.
- Any visible leaks on feed piping to be noted and repaired.
- Replace stone media in both biofilters with stone meeting the following specifications:

- **Stone Type:** Basalt, Gabro Roc, Granite or Quartzite
- **Nominal Size reqd:** 73mm dia Ballast Stone or similar
- **Coef of Uniformity:** < 4
- **Relative Density:** 2.65 to 2.94
- **Water Absorption:** 0.4 to 0.6
- **Flakiness Index:** 15% maximum limit
- **Voids Content:** > 40%
- **Size Distribution**

BS410 Test Sieves (mm)	Nominal Stone Size			
	73	63	50	40
	% By Mass		Passing	
75	100			
63	85 - 100	100		
50	0 - 25	85 - 100	100	
37	0 - 5	0 - 20	85 - 100	100
28		0 - 5	0 - 20	85 - 100
20			0 - 5	0 - 20
14				0 - 5

- Stone media should be washed and free of dust and small particles, and be placed carefully so as to cause the minimum breakdown of stone and to ensure a high void ratio. No compaction of stone whatsoever must take place during placement. On completion, stone media must be raked to a level uniform surface approximately 150mm below the top level of the concrete tank.
- Reinstallation of the refurbished distributor center column.
- Re-attachment and levelling of the refurbished distribution pipes complete with cable stays and turn buckles.
- Re-commissioning of the biofilter ensuring that water distribution is even and covers the complete surface uniformly.
- Biofilters should be refurbished one at a time to allow for partial treatment of incoming wastewater during construction.

C 3.1.5.9 Refurbishment of Mechanical equipment on Clarifiers

- Each Clarifier is fitted with a heavy-duty worm and wheel gearbox powered by an electrical motor via a V-belt and pulleys. This gearbox drives mechanical scrapers in the settlement compartments of the tank by means of a centrally located vertical shaft.
- Contractor will strip the assembly, and remove the gearbox for refurbishment. This will include stripping the gearbox, replacing bearings, oil seals and any broken or defective internal parts, reassembly, replacing oil and grease and refitting the gearbox back in its original position. **No leakage of oil will be acceptable after refurbishment of these units.**
- The central shaft and scraper assembly's will be inspected for mechanical damage, rust and corrosion.
- Structural repairs will be affected by welding in replacement steel sections where required and then grit blasting to SA2½.
- Structure will then be repainted with a suitable coating such as Carboline Carboguard 193 or similar to at least 200µm DFT.
- Scrapers will be properly aligned and secured to ensure smooth rotational movement around the centre column.
- All floor scrapers to be fitted with 500mm x 70mm x 10mm thick nitrile rubber leading edges in full contact with the concrete floor.

- Both the central Inlet Pipe, as well as the launder outlet pipe, shall be thoroughly cleaned out using a high-pressure water hydroblast machine. This is required to ensure that all solids, rags and debris lodged in these pipes are removed.
- Should any visible leakage occur during the hydroblast cleaning, such leaks will be noted and repaired to render a leak free supply and delivery pipe.
- On completion, the Clarifiers must be in good operational condition and all mechanical equipment must be fully operational before being re-commissioned

C3.1.5.10 Clarifier Outlet Pipework Modification

The original layout of this plant allowed the supernatant from Clarifier 1 and Clarifier 2 to be returned to the Raw Sewage Inlet Sump, from where it was recycled back to the Clarifiers and subsequently the Biofilters. Settled Humus from both Clarifier 1 was passed through the Hamlin Sand Filters, **(which are no longer operational)** and then allowed to flow to the Effluent Pump Station. The Humus from Clarifier 2, was directed into the Flocculation Tank, was dosed with Alum for removal of Phosphates, and then allowed to pass through a second set of Hamlin Filters. The filtered water then flowed to the Effluent Pump Station, where it was either pumped to the Detention Tank, or to the mine for use as process water. **This flowpath is no longer feasible, as the Hamlin Filters are not operational, nor is the Alum dosing and Flocculation Tank.**

Therefore, the Engineer proposes that the flowpath be modified as follows:

- Clarifier 1 and Clarifier 2 humus/sludge outlet be directed to the Flocculation Tank.
- That the Flocculation Tank be modified from a flat bottom tank to a conical Dortmund Tank.
- Settled Humus be allowed to be extracted under hydrostatic pressure into an adjacent sump, from where the sludge can be pumped to the drying beds.
- The supernatant from the Flocculation Tank, shall flow to the old Final Effluent Pump Station sump, from where a set of new pumps will pump the effluent into the old Detention Tank.

- From the Detention Tank, water will flow under gravity to the Chlorine Contact Tank for disinfection.
- A new set of Final Discharge Pumps will be installed, abstracting the disinfected water from the Chlorine Contact Tank, pump the water through a set of 10 Pressure Sand Filters and then discharge the water into the Schaap River.

C 3.1.5.11 Modification of the Flocculation Tank to a Dortmund Humus Settling Tank

- This section of the works proposes to modify the existing flat bottom 10m diameter Flocculation Tank to a Dortmund-type tank which is conical in shape.
- It is proposed that the centre of the concrete floor of the existing tank be broken up for an area of 4m x 4m.
- Contractor is to then excavate down below the existing floor level to the required depth of the cone. (Approximately 5m below existing floor level). Excavation to be done using chemical expansion methods or hand tools.
- Once having reached the desired a depth, a 450mm thick floor slab will be cast providing the base for the conical section of the clarifier.
- The Contractor will proceed to create a circular conical shape inside the exiting tank walls with an angle of 60°, utilizing a 10% Soilcrete mix to form an accurate sacrificial outside shutter for the conical tank up to a point 1.50m below the existing overflow weir.
- The contractor will proceed to erect an internal custom-made conical shutter to form a circular cone with an angle of 60°. The conical section to be cast in 2 or more lifts to create a new concrete cone inside the existing flatbottom tank walls.
- The concrete floor around the cone will be repaired to ensure a watertight seal where the old and new concrete meets.
- The Contractor will construct a Sludge Sump adjacent to the sludge outlet with dimensions of 1.50m x 2.00m x 4.00m deep. Construction to be done using reinforced concrete at least 250mm thick.

Mechanical Works

- A new channel section galvanized mild steel bridge will be placed across the modified tank, complete with handrails and open grid flooring.
- A 1.60m diameter 6mm thick galvanized mild steel flocculation chamber will be hung from the new bridge complete with a 200mm galvanized mild steel bend and bell mouth for distribution of the flocculated water inside the flocculation chamber.
- Two (2) new 200mm diameter uPVC pipes from the existing Clarifiers' sludge/humus outlets will pass through the clarifier wall 850mm below ground level and connect to the mild steel flocculation chamber with a Viking-Johnson coupling to deliver humus/water to the clarifier.
- A 150mm diameter desludge pipe will be fitted inside the conical section of the clarifier to allow removal of the settled sludge by means of hydrostatic pressure.
- Contractor will supply and install 1 number new Gorman-Rupp self priming pumps to transfer sludge from the sump to the Sludge Drying Beds.
- Supernatant from the Flocculation Tank will flow under gravity through an existing pipeline to the Final Effluent Pump Sump.

C 3.1.5.12 Refurbishment of Detention Tank

- Contractor to empty all liquid out of the structure into the adjacent unit right down to floor level.
- Contractor to remove all sludge from compartments where applicable, either by diluting it to a degree where it is liquid enough to pump, or by hand. Removed sludge to be disposed of in the plant drying beds for solar drying.
- On removal of all liquids and sludge from these compartments, all internal concrete will be washed clean with a high-pressure water jet and then inspected for cracks and or concrete corrosion.
- Severe cracks (> 2mm in width) shall be repaired using a suitable cementitious mortar (SIKA Monotop or similar), and then sealed off with a suitable sealant (SIKAGARD-63N or similar).
- Areas where concrete corrosion have occurred, will be scrubbed to remove all loose material and laitance. Area is then to be prepared and repaired with a suitable epoxy mortar (SIKA Monotop or similar).

- Areas which have spalled and where rebar is visible shall be suitably repaired and made good to be functional and to avoid further deterioration and corrosion taking place.
- Contractor to clean out Inlet and Sludge Outlet pipework by passing a high pressure hidroblast through these pipes to remove accumulated sludge and debris.
- The existing cantilevered walkway is to be removed and replaced entirely, as it is no longer safe for use. The replacement shall be done using Galv.Mild Steel members securely attached to the concrete walls using M16 Sleeve anchors or similar. New walkway to be covered with Fibertek FRP 38mm x 38mm x 38mm Open Grid Flooring supported on 50mm x 50mm angles and fixed with suitable clips, staircases included.
- Contractor to supply and install new Gr.316 SS Scum Baffles 350mm deep onto each cross weir of the Detention Tank.
- All old 150mm dia Sludge Outlet Valves to be replaced with new RSV Type Gate Valves flanged to suit existing. Contractor to make up space difference with spool pieces if required.
- Sludge Outlet pipe to be traced to determine destination. Should be to Flocculant tank. Contractor to confirm.
- Contractor to strip out existing old 100mm dia outlet pipe from outlet sump.
- Contractor to supply materials and install a new 250mm uPVC gravity outlet pipe between the Detention Tank outlet chamber and the Chlorine Contact Tank. Pipe is approximately 70m in length.

C 3.1.5.13 Refurbishment of the Old Final Effluent Pump Station

- The supernatant from the newly modified Flocculation Tank, will now flow under gravity to the Old Final Effluent Pump Station Sump.
- Old Pump Sump to be emptied of water, sludge and debris, thoroughly cleaned out and inspected for structural concrete damage.
- Contractor to repair any structural damage such as cracks, concrete corrosion and spalling.
- Contractor is to strip out old pumps, motors, pipework and existing Electrical switchgear to spoil.

- Contractor to supply, deliver, install and commission two number Gorman-Rupp self-priming pumps, each with a duty of 35 liters per second at a total head of 10m.
- Pumps to be supplied complete with suction piping, delivery manifold, non-return valves and isolating valves to provide a complete and functional pumping system.
- Pumps to be controlled by an ultrasonic level sensor, which reads the waterlevel in the sump and then starts a pump at 80% full and switches the pump off at 25% of sump waterlevel. Pumps to alternate after each start cycle.

C3.1.5.14 Chemical Dosing for Disinfection

- Contractor to provide a complete chemical dosing system comprising the following:
 - 2 x Milton Roy Chemical Metering Pumps powered by 400V 3-phase electrical power and adjustable by means of both rotational speed using a VSD as well as mechanical adjustment of the stroke length. Duty point to be 75 l/h at 6bar pressure.
 - 2 x Pressure Sustaining Valves
 - 2 x Pressure Relief Valves
 - 1 x 1500 ml Calibration tube
 - 20mm dia uPVC Pipework for suction side abstracting chlorine solution 250mm above tank floor to avoid calcium crystals.
 - 20mm dia uPVC Pipework for delivery side
 - All of the above to be mounted on a wall-mounted Dosing Bench manufactured from Polyethylene or Polypropylene sheets.
 - 2 x 500-liter Polypropylene Day Tanks for make up of Chlorine solution using Calcium Hypochlorite granules.
 - 20mm dia uPVC Water Supply piping for filling of the Daytanks
 - 40mm dia Scour Outlet on each Daytank c/w valve to drainage point.
 - Complete unit to be manufactured, supplied, installed and commissioned on site to the satisfaction of the Engineer.

C.3.1.5.15 *Replacement of the Treated Effluent Pressure Filters and Discharge Pumping Station*

The existing pressure sand filters, pumps, air blowers and all related pipeworks and Electrical switchgear to be stripped out and removed to spoil.

Contractor to supply, install and commission the following equipment:

Pumping Equipment

- 2 x End-Scution Centrifugal Pumps complete with 400V 3-Phase Electrical Motors, couplings and baseplates with a Duty Point of 45 liters per second at a total head of 20m. (KSB preferred supplier)
- 200mm dia Galvanized Mild Steel Suction piping flanged to SANS 1123 Table 600 to abstract disinfected water from the Chlorine Contact Tank complete with wafer-type Butterfly isolating valves.
- 150mm dia Galvanized Mild Steel delivery piping to a distance of 1500mm outside existing building complete with reducers, non-return valves and RSV type Isolating valves.

Filtration Equipment

- Filters must be of the pressurized sand filter type. A single clean filter must have a nominal filtration capacity of 7.5 m³/h at a surface loading rate not exceeding 12m/h. Each filter to have a minimum diameter of 940mm with a surface area not less than 0.7m². Filterbed depth shall be a minimum of 900mm.
- Inlet and outlet ports shall be 80mm diameter with flanged connections. The filter is to be fitted with a bottom support flange and sand draining port not smaller than 80mm diameter. Each filter must have a side access port for inspection of the sand and servicing of the underdrain. This port must be provided with a lid which is easily removable yet water tight during operation.
- For this plant it is suggested to use a single bank of six (6) filters each to achieve a total filtration capacity of 45 m³/h.
- The preferred filter for this project is the CONN 60 VERTIN STRETCH BODY filter supplied by Messrs CONNS Manufacturing (Pty) Ltd PO Box 748 Brackenfell.

Underdrain system

- The preferred underdrain system shall comprise a 75mm diameter central manifold with perpendicular slotted collectors of which the length shall decrease from the centre outwards.
- The underdrain nozzles shall be arranged in a manner to ensure an even flow of filtrate as well as a uniform distribution of backwash water.
- Slot openings on collectors shall not exceed 0.35mm.
- Contractors are to provide complete details with regards to the under drains that they propose.

Filter Media

- Filter media shall be sand from a quartzitic origin and have an effective size **between 0.6mm and 0.9mm** with a uniformity coefficient not exceeding 1.4.
- Contractors will provide proof of the effective size and uniformity coefficient from his sand supplier which is to be included in the tender documents.
- The preferred sand supplier is Silica Quartz (Pty) Ltd PO Box 157 Delmas.

Filter Body and coatings

- Filters body shall be manufactured from mild steel covered with an epoxy coating. Internal coating is to have a thickness of 450 – 500 microns.
- Epoxy shall be similar to a heat cured anti corrosive pipe coating. External coating will have a minimum thickness of 200 – 250 micron and shall comprise a polyester UV resistant coating.

Manifolds and pipe work

- Filters are to be supplied complete with 150mm dia galvanized mild steel inlet manifold, 150mm dia outlet manifold and 90mm dia uPVC backwash water collector manifold.
- Contractors will supply all valves (isolating as well as hydraulic control), gauges, fittings and connectors necessary to operate and backwash the filter banks as per the process description.

Civil Works:

- Construction of Reinforced concrete plinth for 2 x pumpsets (1.20m wide x 2.00m long x 600mm deep) and concrete plinth for Pressure Filter set (7.90 x 2.10m x 550mm high).
- Construction of 160mm dia uPVC Class 9 connector piping between the Final Discharge Pump Station and the Schaap River outlet.
- This pipe will cross the existing gravel road and will be laid to have a cover of not less than 800mm above the pipe. Final backfills to be done with a G6 material compacted to 98% Mod AASHTO density on completion.

C 3.1.5.16 Electrical Works

The existing electrical supply system to the Nababeep WWTP is a 525V 3-Phase supply originally installed by the Okiep Copper Company in the 1960's. It is the intention of the Engineer to convert the entire electrical supply system of the Nababeep WWTP to a 400V 3-phase supply system, inclusive of supply transformer, distribution cabling and motor control centers. It is envisaged that the following works will be required:

Transformer:

- Supply, deliver and install a new 150 kVA minisub type transformer complete with kW.h and Maximum Demand Metering unit installed. Unit to be supplied complete with required Circuit Breakers as well as at least two spare circuit breakers.
- Contractor to install a set of pole-mounted 11kV drop out fuses and surge arrestors on the existing overhead supply where the line terminates. A 600/1000V MV cable will be used to connect the existing 11kV supply to the new 150KVA Minisub Transformer.
- Contractor to supply a new 150kVA Diesel powered Standby Generator c/w Automatic Change Over Unit, Bulk Diesel Tank and cabling to connect to the proposed new electrical supply system.
- Contractor to supply, install and commission completely new cabling network from the new Minisub Transformer to the various points of use, utilizing underground cables complete with markers and trenching. Cables to vary from 120mm² to 6 mm² in size.

Proposed New Motor Control Centres

MCC No.1 : Raw Sewage Inlet Pump Station MCC

- *Main Incomer cubicle*
- *Local DB for lights, power sockets and instrumentation*
- *Starters required:*
 - *2 x 7.5kW Archimedes Screw Pumps with VSD starters (Auto/Manual)*
 - *2 x 7.5kW Raw Sewage Pumps with VSD starters (Auto / Manual)*
 - *2 x 7.5kW Clarigester Scraper Drives VSD Starters (Manual only)*
 - *2 x 2.20kW Clarigester Sludge Pumps VSD Starters (Manual only)*
 - *2 x 7.5kW Clarifier Scraper Drives VSD Starters (Manual Only)*
 - *2 x 4kW Settled Humus Sludge Pumps VSD Starters (Auto / Manual)*
- *Instrumentation*
 - *1 x Ultrasonic Level sensor for Screw Pump control*
 - *1 x Ultrasonic Level Sensor for Open Channel Flow*
 - *1 x Sime Multicon Datalogger for Flow measurement*
 - *1 x Ultrasonic Level Sensor for Raw Sewage Pump control*
 - *1 x Ultrasonic Level Sensor for Humus Sludge Pump Control*

MCC No.2: Final Effluent Pump Station MCC

- *Main Incomer cubicle*
- *Local DB for lights, power sockets and instrumentation*
- *Starters required:*
 - *2 x 5.5kW Final Effluent Pumps with VSD starters (Auto/Manual)*
- *Instrumentation*
 - *1 x Ultrasonic Level sensor for Final effluent Pump control*

MCC No.3: Final Discharge Pump Station

- *Main Incomer cubicle*
- *Local DB for lights, power sockets and instrumentation*
- *Starters required:*
 - *2 x 15kW Final Effluent Pumps with VSD starters (Auto/Manual)*
 - *2 x 1kW Chemical Dosing Pumps with VSD starters (Auto/Manual)*
- *Filter Backwash Controller + 6 x solenoid valves*
- *Instrumentation*
 - *1 x Ultrasonic Level sensor for Final Discharge Pump control*
 - *1 x Magnetic Flow Meter for final effluent flow measurement*
 - *1 x Simex Multicon Datalogger for flow measurements*

Lighting

- All buildings to be fitted with a minimum 4 x 6ft LED Fluorescent Tubes
- Minimum of 2 x 15A Plug Socket Outlets
- 1 x 70A 3-Phase Welding Socket Outlet
- 4 x LED Floodlights mounted as high as possible

Site Lighting

- 1 Number 25m Scissor Masts c/w concrete foundation and holding down bolts
- 1 Sets x 279W LED Mast Luminaires

NAMA-KHOI MUNICIPALITY**BID/NC062/03/2023/2023****PROJECT NO.35008.00/2023/01****REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS****C3.2 Engineering****DRAWINGS ISSUED WITH THIS DOCUMENT**

The following drawings are applicable to the contract and will form part of the Contract Document. The drawings are / or must be attached to this document under C3.5 Annexes.

DWG No.	SHORT DESCRIPTION	SIZE	REVISIONS		
			T0	0	1
	<u>TENDER DRAWINGS:</u>				
35008.00-001-01	PROJECT NAME BOARD	A3	26-07-2023		
35008.00-100-01	GENERAL LAYOUT: EXISTING NABABEEP WWTP	A1	26-07-2023		
35008.00-100-02	GENERAL LAYOUT: NEW PIPES LAYOUT	A1	26-07-2023		
35008.00-100-03	GENERAL LAYOUT: NEW ELECTRICAL LAYOUT	A1	26-07-2023		
35008.00-201-01	NEW SUMP BUILDING STRUCTURAL DETAILS	A1	26-07-2023		
35008.00-201-02	NEW SUMP BUILDING MECHANICAL DETAILS	A1	26-07-2023		
35008.00-201-03	3D VIEWS NEW SCREW PUMPS AND INLET WORKS	A1	26-07-2023		
35008.00-201-04	FLOCCULATION TANK MODIFICATION – CONCRETE DETAILS	A1	26-07-2023		
35008.00-204-01	FLOCCULATION TANK MODIFICATION – STEEL REINFORCING	A1	26-07-2023		
35008.00-210-01	SCREW PUMPS AND INLET WORKS DETAILS	A0	26-07-2023		
35008.00 – 210-02	FLOCCULATION TANK MODIFICATION – BRIDGE DETAILS	A1	26-07-2023		
35008.00-700-01	NEW SUMP BUILDING ELEVATION DETAILS	A1	26-07-2023		
35008-712-01	FLOCCULATION TANK MODIFICATION – MECHANICAL DETAILS	A1	26-07-2023		

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C3.3 Construction

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REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

C3.3 CONSTRUCTION

C3.3.1 STANDARD SPECIFICATIONS

The standard specifications on which this contract is based are the **South African National of Standard Standardised for Civil Engineering Construction SANS 1200**. (Note to compiler. "SANS" has been changed to "SANS"; the SANS 1200 specifications are due to be replaced in the foreseeable future by SANS 1200).

Although not bound in nor issued with this Document, the following Sections of the Standardized Specifications of SANS 1200 shall form part of this Contract.

SANS	1200	A	-	1986	:	GENERAL		
SANS	1200	AB	-	1986	:	ENGINEERS OFFICE		
SANS	1200	C	-	1980	:	SITE CLEARANCE		
SANS	1200	DB	-	1989	:	EARTHWORKS (PIPE TRENCHES)		
SANS	1200	D	-	1988	:	EARTHWORKS		
SANS	1200	G	-	1982	:	CONCRETE (STRUCTURAL)		
SANS	1200	H	-	1990	:	STRUCTURAL STEEL WORK		
SANS	1200	HC	-	1988	:	CORROSION PROTECTION OF STRUCTURAL STEELWORK		
SANS	1200	HB	-		:	HANDRAILING AND FLOORS		
SANS	1200	L	-	1983	:	MEDIUM PRESSURE PIPELINES		
SANS	1200	LB	-	1983	:	BEDDING (PIPE)		
SANS	1123		-	2015	:	PIPE FLANGES		
SABS	1215		-	1984	:	CONCRETE MASONRY UNITS		
SABS	227		-	1986	:	MASONRY UNITS OF BURNT CLAY		
SANS	10400		-	2010	:	APPLICATION OF NATIONAL BUILDING REGULATIONS		
SANS	2001	CC2	-	2007	:	CONCRETE WORKS (MINOR WORKS)		
SANS	2001	CM1	-	2007	:	MASONRY WALLING		
SANS	2001	EM1	-	2007	:	CEMENT PLASTER		

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REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

C3.3.2 PROJECT SPECIFICATIONS

C3.3.2.1 VARIATION AND ADDITIONAL CLAUSES TO THE STANDARD SPECIFICATION LISTED IN THE LIST OF SPECIFICATIONS

PSA GENERAL (SANS 1200A)

PSA5 CONSTRUCTION

PSA5.1 Setting out of the Works

The Contractor shall inform the Engineer of any conflict between the position of any part of the Works and an existing feature. The setting out of the Works is the Contractor's responsibility.

PSA5.2 Accommodation of traffic

The Contractor shall provide and maintain all temporary road signs, etc. that are necessary for the normal safe flow of traffic (vehicles and pedestrians).

PSA5.3 Existing services

All services shall be treated as live until proven otherwise. The Contractor shall not commence work in an area until proper arrangements have been made for supervision of the work by the relevant authority.

The Contractor shall give assistance to service authorities with the location, protection and relocation of services controlled by that authority.

PSA7 TESTING

PSA7.1 Testing Principles

Test results must comply with the minimum prescribed specifications and no statistical evaluations will be accepted

PSA8 MEASUREMENT AND PAYMENT

PSA8.2 Dealing with storm water

The cost of controlling storm water will be held to be included for in the tendered sums for Items (A1, B1 and C1) and (A, B2 and C2) and no separate payment will be made for this work.

PSA8.3 Dealing with existing services

The following works that are executed by the Contractor on the instruction of the Engineer will be measured and paid for under "Daywork" rates.

- (i) All additional work to locate and expose the existing service if the existing service is situated further than 2.0 m from the position indicated, (i.e., excluding the initial work within 2.0 m from the indicated position).
- (ii) Work that is carried out by the Contractor with regard to existing services that are not indicated on the drawings and for which the Employer will carry the cost according to Subclause 5.4.

PSA8.4 Testing of Materials

The Engineer reserves the right to carry out any test he deems necessary using commercial laboratories to ensure compliance of the materials supplied for use in the works with the requirements of the applicable SANS 1200 specification, or to ensure that the standard of workmanship meets the requirements of the Specification.

In the event of these check tests not meeting the requirements of the Specification, the cost of such tests shall be for the Contractor's account. If the tests meet with the requirements of the Specification, the Contractor will be required to pay the account of the laboratory concerned, but such payments will be recoverable under the provisional sum allowed for in the Bills of Quantities. The Contractor's tendered mark-up must allow for arranging the necessary testing and for payment, if applicable, through the contract.

PSA8.6 Miscellaneous

An item, which, in the payment clause column of the Bills of Quantities, refers to this clause (PSA8-5), will be measured in the unit scheduled. Any item omitted, the sum or rate for such item shall cover the cost of all material, labour and plant to execute and complete the work as specified, described in the Bills of Quantities or shown on the drawing(s). Any items omitted in the schedule to complete the work successfully must either be allowed for in the rate or a separate item should be entered if so required.

PSA8.8 Temporary Works

PSA8.8.1 Main Access to Site

Add the following:

There will be no payment for the construction of a temporary gravel road or the maintenance of the existing road on the site. The contractor must make sure that any costs to access the site is included in item (A1, B1 and C1) and (A2, B2 and C2) in the Bill of Quantities of the contract data.

PSA8.8.4 Existing Services

Add the following:

"For the exposure of existing services, an item for the excavation of soft material by hand in cubic meters has been provided for. The tariffs include all necessary payments for the excavation as instructed by the engineer. The tariffs will also include the backfilling and compacting of the materials, the transport of all surplus material, the safeguard of the excavations and any other works necessary to complete the works. Transport of up to 0.5 kilometres of the material will be included in the tariffs.

ENGINEERS OFFICE (SANS 1200AB)

PSAB3 MATERIALS

PSAB3.1 Facilities for the Engineer

a) **Name boards**

The Contractor shall supply and erect, to the satisfaction of the Engineer, two project boards as shown on relevant drawings.

PSAB4 PLANT

PSAB4.1 Survey equipment

The Contractor shall provide the following survey equipment for use by the Engineer.

- a) Automatic level with tripod and staff
- b) All steel and wood pegs, concrete, hammers, picks, etc that the Engineer may require.
- c) Steel tape of length 50 m.
- d) Measuring wheel
- e) At least one survey assistants
- f) Safety and Medical Emergency Equipment etc.

PSC **SITE CLEARANCE**

PSC5 **CONSTRUCTION**

PSC5.1 **Disposal of material (Subclause 3.1)**

Material obtained from demolishing and unwanted excavated material, shall be disposed of away from the site as indicated by the engineer.

PSDB **EARTHWORKS (PIPE TRENCHES)**

PSDB3 **MATERIAL**

PSDB3.1 **Method of classifying (Sub clause 3.1.1)**

The Contractor may use any method he chooses to excavate any class of material but his chosen method of excavation **shall not determine** the classification of the excavation. The Engineer or his Representative will decide on the classification of the materials. In the first instance the classification will be based on inspection of the material to be excavated and on the criteria given in PSD3.2.

PSDB3.2 **Classification of excavation (Sub clause 3.1.2)**

All material encountered in any excavations for any purpose including restricted excavation will be classified as follows:

a) **Hard rock excavation**

Hard rock excavation shall be excavation in material (including boulders exceeding 0.15 cubic metres in individual volume) that cannot be efficiently removed without blasting or without wedging and splitting or be in material, which cannot be excavated by a loader/backhoe or by a scraper without prior ripping.

b) **Intermediate excavation**

Intermediate material will not be measured on this contract.

c) **Soft excavation**

Soft excavation shall be all material not falling into the category of hard rock or calcrete excavation.

PSDB 3.3 **Selected Granular Material**

Add the following:

"Where appropriate materials for backfilling is available in layers of 150 millimetres or more, the materials will be separated from the other materials for backfilling

PSDB 3.5 **Backfilling Material**

PSDB 3.5.2 Disposal of Surplus Material

Add the following:

The Engineer will decide which materials are unsuitable for backfilling. The rest of the materials must be disposed at a site as indicated by the engineer

PSDB5 **CONSTRUCTION**

PSDB5.2 **Minimum Base Widths**

<u>Outside diameter of pipe, mm</u>		<u>Side allowance on both sides, mm</u>
<u>Above</u>	<u>To</u>	<u>Sides mm</u>
-	125	300
125	700	300
700	1000	400
1000	2000	500
2000	-	600

PSDB5.3 Existing services

The Contractor shall bear the full cost of the repairs to any existing services damaged because of the Contractors activities.

PSDB5.4 Dust

The Contractor is responsible for the control of excessive dusty conditions due to the construction procedures. The Contractor shall also be held responsible for any claims that might arise. The Contractor to allow for regular watering of areas to control dust.

PSDB5.9 Road Traffic Control

Add the following to D5.1.6

- a) Sufficient road signs must be erected in such a way the motorists will be warned in time of works, e.g. at the closing of a street sufficient signs to direct traffic must be erected at the preceding intersection.
- b) Bypasses and/or road signs shall be provided and/or erected at all locations where the free flow of traffic is obstructed and shall be approved by the Engineer before the commencement of construction. Where main roads are crossed, detours and temporary traffic signs must be provided as shown on the attached drawings.
- c) Where a trench crosses a street or any place where a trench crosses the direction of traffic flow, drums must be placed in the street and not just along the sides of the street with danger tape in between.
- d) Danger tape must be put up between drums and tied around the drums.
- e) Drums must be filled with stones. The spacing of drums must be in such a way (maximum 5m) that they are visible from all directions.
- f) Sufficient safety measures must be utilized for pedestrians.

PSDB5.10 Areas subject to traffic loads (Subclasses 3.5(b) and 5.7.2)

All trenches within the road reserves will be considered to be subject to traffic loads and the backfill material and compaction in these trenches shall comply with the requirements of Sub clauses 3.5(b) and

PSDB5.11 Suitable backfill material

It is likely that some of the material excavated from the trenches will not comply with Sub clauses 3.5 and 4.6.2. Suitable material from other sections along the pipe route shall be used to complete the backfilling to these trenches. The unsuitable material shall be removed from site and spoiled at the designated spoil site as indicated by the Engineer.

PSDB7 TESTING

PSDB7.1 Testing and compaction of backfill to trenches and reinstatement of surfaces (Sub-Clause 7.1)

The Contractor must furnish the Engineer with compaction tests results to prove that the compaction comply to the prescribed density. No single test result, which is below the specified density, will be accepted.

PSDB8 MEASUREMENT AND PAYMENT

PSDB8.1 Excavation (Sub Clause 8.3.2)

The rates for excavation shall include the cost of battery of deep excavations to comply with the latest OSH Act.

The rates for excavation of trenches shall also cover all costs of density testing to be borne by the Contractor as specified in PSDB7.1 and the provision of suitable backfill material from other excavations where required.

PSG **CONCRETE (STRUCTURAL) (SANS 1200 G)**

PSG2 **Interpretations**

PSG2.1 **Definitions (Subclause 2.3)**

Under (a) add:

A Constructional joint: a joint required on account of constraints or convenience in the method of construction and that is not a movement, contraction or expansion joint.

PSG2.2 **Exposure Condition (Subclause 2.4.1)**

All Concrete on the Works shall be as specified for severe exposure condition.

PSG2.3 **Strength Concrete (Subclause 2.4.2)**

Grade 30MPa/19mm means strength concrete grade 30 MPa with 19 mm stone.

PSG2.4 **Joints**

Notwithstanding Subclause 2.4.3, designed joints will only be joints that are shown on the drawings. Any other joints that are required by the contractor as a result of his construction constraints or for any other reason, whether approved by the Engineer or not, will not be considered to be designated joints as defined in Subclause 2.4.3, i.e. they will be considered to be non-designated joints.

PSG3 **MATERIALS**

PSG3.1 **Cement (Subclause 3.2)**

All cement used in the works shall be ordinary Portland cement complying with SANS 471.

PSG3.2 **Storage (Subclause 3.2.3)**

Cement shall be used in the order in which it is received. Unless approved by the Engineer, cement kept in storage for longer than 8 weeks shall not be used in the Works. Any cement that contains lumps that cannot easily be crumbled to powder between the fingers may not be used.

PSG3.3 **Water (Subclause 3.3)**

Only potable water from an approved source may be used for mixing concrete.

PSG3.4 **Aggregate (Subclause 3.4)**

The nominal stone size specified in the concrete grade (e.g. 30 MPa/40 mm) shall mean stone conforming to the grading specified in SANS 1083 for the nearest equivalent size, i.e. 40 mm means stone that complies with SANS 1083 for 37,5 mm size. Aggregates with a shrinkage higher than 130% will not be allowed.

PSG 3.4.1 Coarse Aggregate

PSG 3.4.1.1 Coarse Aggregate must comply with the 10%FACT requirements set for durability.

PSG 3.4.1.2 The nominal aggregate size is the smallest of the 37.5-millimetre maximum particle size and 25% of the slab thickness.

PSG 3.4.1.3 If the nominal aggregate size is larger than 26.5 millimetres, the coarse aggregate must consist of a mixture of aggregates larger than 26.5 millimetres and aggregates smaller than 26.5 millimetres.

PSG 3.4.2 Fine aggregate

PSG 3.4.2.1 Fine aggregate may not contain more than 40% Silicon particles.

PSG 3.4.2.2 Adjustments must be made to the mixture design if the Fineness Modulus of the fine aggregates varies more than $\pm 0, 2$ during construction.

PSG 3.4.3 **Mixture Design**

A complete concrete mixture design must be submitted to the Engineer for approval before the commencement of the works.

The Contractor must have sufficient cube moulds to make test cubes on a daily base on request of the Engineer.

Care must be taken with the design of the mixture, to limit bleeding to a minimum. Special attention must be given to the fine aggregate if bleeding occurs.

PSG3.5 **Samples (Subclause 3.4)**

At least one month before commencement of concrete work the contractor shall supply, at his own cost, provide representative samples to the engineer of the aggregates he intends using, together with certificates from an approved laboratory indicating that the aggregates comply with the specifications. Approximately 50 kg of each sample of aggregate shall be supplied.

After approval, these samples shall be taken as standard for the agreed aggregates to be used in the Works. If at any time during the course of the Contract the Engineer considers that there has been any deviation from the approved standard the contractor shall submit further tested samples of material to the Engineer for approval.

PSG3.7 **Admixtures (Subclause 3.5.1)**

The use of admixtures will be subject to the approval of the Engineer.

The information listed in Subclause 3.5.1 shall be provided.

PSG4 **PLANT**

PSG4.1 **Mixing plant and vibrators (Subclauses 4.3 and 4.4)**

Standby mixers and vibrators of adequate capacity and with an independent power unit. Unit shall be maintained on site for immediate use in the event of breakdown of the regular mixers or vibrators or failure of the power supply.

PSG4.2 **Formwork Ties (Subclause 4.5.3)**

The use of sleeves for formwork ties through the walls of water-retaining structures will not be permitted. Ties, when cast in, shall have some form of positive anchorage to prevent any rotation when loosening formwork.

PSG4.3 **Formwork: Chamfers and Fillets**

Air exposed external angles in concrete work shall have 20 mm x 20 mm chamfers unless otherwise specified or ordered, but the top edge of a slab that is to receive an applied finish, shall not be chamfered.

Internal corners in concrete work need not have fillets unless such fillets have been specified on the drawings or ordered by the Engineer.

PSG4.4 **Water-bath**

A temperature-controlled water-bath shall be provided on site. The water-bath shall be located under cover.

PSG5 **CONSTRUCTION**

PSG5.1 **REINFORCEMENT**

PSG5.1.1 **Fixing (Subclause 5.1.2)**

Fixing of reinforcing bars by welding and heating of bars will not be permitted.

PSG5.1.2 Spacers

Spacers of approved design include approved plastic or other proprietary spacers, or purpose made precast mortar blocks.

Where mortar blocks are being used, they shall be properly shaped so as to slip out of position and shall be made of the same mix as the mortar of the concrete in which they are to be placed. The mortar shall be well compacted by approved means into the moulds to result in blocks with a density of at least 2 300 kg/m³; and which are free from honeycombing. The mortar blocks shall be cured in water for at least 7 days. Blocks which have not been manufactured and cured strictly in accordance with these requirements or which are in any other way considered unsatisfactory by the Engineer, will be rejected and shall be removed from the site.

PSG5.1.3 Cover (Subclause 5.1.3)

In Subclause 5.1.3(a) amend the words bar or stirrup to read: bar, secondary reinforcement, tie stirrup, tying-wire knots or wire ends.

Add to Subclause 5.1.3: (a) Tying wire may not encroach on the specified minimum cover by more than a single strand thickness. The cover to steel reinforcement shall not be less than 40 mm.

PSG5.2 FORMWORK

PSG5.2.1 Classification of finishes (Subclause 5.2.1)

Formwork for formed concrete surfaces against which backfill will be placed shall be rough. Formwork for formed concrete surfaces shall be smooth, except where otherwise specified.

PSG5.2.2 Special Smooth Finish

All concrete surfaces that will be exposed above the final ground levels shall have a special smooth finish to a Degree of Accuracy I. The formwork used shall be high-grade, unblemished and regular in size. Formwork ties shall be placed in a regular pattern. The special smooth finish shall be an off-shutter finish to the concrete such that no after treatment is required other than at the positions of formwork ties.

PSG5.3 CONCRETE

PSG5.3.1 General (Subclause 5.5.1.1)

The concrete mix design for strength concrete must be prepared in an approved laboratory and the results of actual test mixes must be submitted for approval together with 7-day and 28-day strength test results. Special attention is drawn to the fact that the concrete mix used for water retaining structures must provide a very dense and impervious concrete.

No concrete shall be cast until the mix designs have been approved by the Engineer. The Engineer may call for revised mix designs at any stage during the Contract.

PSG5.3.2 Slump (Subclause 5.5.1.2)

The slump for vibrated concrete shall be a minimum of 30 millimetres and a maximum of 70 millimetres, and for hand-placed concrete, a minimum of 70 millimetres and a maximum of 120 millimetres.

PSG5.3.3 Workability (Subclause 5.5.1.3)

If the necessary compaction of the concrete cannot be obtained, a better-quality aggregate must be used. The use of more water or any addition of admixtures may not be considered without the written permission of the engineer.

PSG5.3.4 Chloride Content (Subclause 5.5.1.4)

With reference to Table 4, efflorescence will not be acceptable on any exposed concrete surface.

PSG5.3.5 Durability (Subclause 5.5.1.5)

Add the following

"The water/cement ratio of all concrete mixes will not be more than 0,53."

PSG5.3.6 Strength Concrete (Subclause 5.5.1.7)

With the exception of mixes weaker than 15MPa, all concrete for structural units/the Works shall be considered to be strength concrete in terms of Subclause 5.5.1.7. All structural concrete shall be according to the prescribed strengths.

PSG5.3.7 Strength Concrete (Subclause 5.5.3.1)

Add the following

"If concrete is mixed by hand, the limit of the quantity of one single mix will be 0,25 cubic meters. Mixing will take place on a waterproof surface. The Cement and Sand will be mixed thoroughly before the addition of stone particles, where after the water will be added last.

PSG5.3.8 Prevention and repair of plastic shrinkage cracks

The contractor shall take whatever measures are necessary to prevent plastic shrinkage cracking in the concrete. Particularly on dry windy days or hot sunny days the contractor shall make provision for fine spraying of the concrete and covering with black plastic sheeting. It may be necessary to change the aggregates or the concrete mix proportions.

If plastic shrinkage cracking occurs, the cracks shall be closed up by re-vibrating the concrete with a poker vibrator, within about three hours of casting. Once the cracks have been closed, the concrete shall be kept thoroughly wet, or covered with plastic sheeting for at least a further three hours.

PSG5.4 CONSTRUCTION JOINTS (SUBCLAUSE 5.5.7)

PSG5.4.1 General

The edge of joints, exposed to view in the finished structure, shall be formed with suitable beads to provide a straight edge true to line and level. As soon as practical, but not before 15 hours after placing, the construction joint surface shall be prepared to receive fresh concrete. This preparation, as specified in 5.5.7.3(a) to (d), shall be such as to improve all laitance or inert and strength less material which may have formed and the specified chipping or sand blasting, shall be such as to produce a roughened surface all over.

When concreting is interrupted, concrete surfaces shall be protected from the sun as specified in Subclause 5.5.8(d) of by means of hessian kept damp until concreting is resumed.

PSG5.4.2 Formed Joints (Generally vertical or near vertical)

Formed joints will be considered to be designated joints as defined in Subclause 2.4.3.
(The forming of a straight edge to a joint as specified in PSG5-4,1 does not constitute a formed joint).

Each joint shall be formed as shown on the drawings, complete with shear keys rebates, waffle formwork, V-feature, water stops, Flexcell or similar joint filler, dowel bars and their PVC tubes, etc. as indicated.

PSG5.5 CURING AND PROTECTION (SUBCLAUSE 5.5.8)

PSG5.5.2 Formed Surfaces

In order to improve the effectiveness of the curing treatment, the specified minimum time for the removal of the formwork shall be four days.

PSG5.5.3 Curing Compound

The use of membrane curing compounds will be allowed on vertical faces or steeply inclined faces (i.e. steeper than 45° to the horizontal) of cast in-situ members of the structures subject to the contractor producing sufficient, satisfactory cube crushing strength test results where the crushing strength of cubes which have been cured with the proposed curing membrane and left exposed to the elements are compared with those of an equal number of water cured cubes. The crushing strength

of the cubes cured with the proposed membrane shall be at least 85% of the crushing strength of the water cured cubes.

The timing of power-floating is critical to its success. Power-floating steel shall not commence until the concrete can support the weight of a man without indentation and until the moisture sheen has disappeared. Thus several hours will have to elapse after concreting has been completed before this operation can commence. Night work may therefore be required.

This main objective of power floating the mortar skim on the no-fines under drainage layer is to achieve a plane, smooth surface. This need not be dense.

PSG5.6 CONCRETE SURFACES (SUBCLAUSE 5.5.10)

PSG5.6.1 Screeded finish

After placing and compacting, the concrete on a top (unformed) surface shall be struck off with a template to the designated grades and tampered with a tamping board to compact the surface thoroughly and to bring mortar to the surface, leaving the surface slightly ridged but generally at the required elevation. No mortar shall be added, and noticeable surface irregularities caused by the displacement of coarse aggregate shall be made good by re-screeding after the interfering aggregate has been removed or tampered.

PSG5.6.2 Wood-floated finish (Subclause 5.5.10.1)

Where wood-floating is ordered or scheduled, the surface shall first be given a finish as specified in PSG5.6.1 and, after the concrete has hardened sufficiently, it shall be wood-floated, either by hand or machine, only sufficiently to produce a uniform surface free from screeding marks.

PSG5.6.3 Steel-floated finish

Where steel-floating is specified or scheduled, the surface shall be treated as specified in PSG5.6.1 except that, when the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, the screeded surface shall be steel-trowelled under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

PSG5.6.4 Power float finish

Where power floating is specified or scheduled the surface shall be treated as specified in PSG5.6.2 except that when the moisture film has disappeared, and the concrete has hardened sufficiently to prevent laitance from being worked in the surface, the screeded surface shall be power floated to produce dense, smooth and uniform surface free of all trowel marks. In corners and areas of restricted access the concrete surface shall be finished by steel floating in accordance in PSG5.6.1.

The timing of power-floating is critical to its success. Power-floating steel shall not commence until the concrete can support the weight of a man without indentation and until the moisture sheen has disappeared. Thus several hours will have to elapse after concreting has been completed before this operation can commence. Night work may therefore be required.

The main object of power floating the mortar skim on the no-fines underdrainage layer is to achieve a plane, smooth surface. This needs to be done.

PSG5.6.5 Broom-swept finish

Where broom-swept finish is specified, the surface shall be treated as specified in PSG5.6.2 and hereafter swept transversely (to the direction of the roadway paving) with a stiff bristle broom to produce an approved no-skid finish.

PSG5.6.6 GRANOLITHIC SCREEDS

PSG5.6.6.1 General

Before placing any granolithic screeds, the base concrete shall be chipped to expose the aggregate over 100% of the area to be screeded and soaked with water for at least 24 hours.

The base concrete shall be thoroughly cleaned by scrubbing and all standing water removed after soaking. A 1:2 cement/sand grout shall then be brushed into the prepared surface followed by the

granolithic screed before the grout sets. The granolithic screed shall be of the driest feasible consistency with a slump not exceeding 50mm and shall be formed true to profile and shape as required and shown on drawings. Before placing granolithic screed against and adjacent band of granolithic screed the edge of the latter shall be prepared by chipping back to firm material, wire brushing and brushing with grout as for the base concrete.

Granolithic screed shall be compacted to remove all air and shall be screeded and finished with a steel trowel to Degree of Accuracy 1.

The trowelling shall be carried out in the following stages: -

- a) First – as soon as the granolithic screed has been compacted and screeded.
- b) Second – after 2 hours to close the surface and remove laitance.
- c) Third – after a further 24 hours.

The time intervals are estimated as appropriate to normal temperature conditions and shall be varied by the Contractor to ensure a smooth dense finish.

Granolithic screed shall be cured as specified in Subclause 5.5.8(b) but shall additionally be protected from direct sunlight and drying winds as it is being placed.

All screeding necessary to accommodate mechanical equipment shall be done under the equipment supplier's supervision and in strict accordance with his instructions. It shall be commenced as soon as the equipment supplier give notice on completion of erection and shall be finished expeditiously.

The Contractor shall make good any damage to the mechanical equipment resulting from his personnel not following the supplier's instructions. Any spillage on the equipment shall be cleaned off immediately.

PSG8 MEASUREMENT AND PAYMENT

PSG8.1 Reinforcement (Subclause 8.1.2.2 and 8.1.2.3)

Notwithstanding the method of measuring and paying for reinforcement specified in Subclause 8.1.2.2 and 8.1.2.3, reinforcement will be measured and paid for as scheduled.

PSG8.2 Concrete (Subclause 8.1.3.3)

The rates for concrete shall also cover:

1. The cost of the preparation of design mixes by an approved laboratory and submission for approval by the Engineer (PSG5-3.1)
2. The cost of non-designated joints (PSG2-2, 4)
3. Screeded finish of unformed surface as specified in PSG5-6,1 and
4. Wood-floated finish to exposed surfaces as specified in PSG5-6,2

PSG8.3 Joints (Subclause 8.5)

Only designated joints as shown on the drawings will be measured for payment according to the length of each type of joint constructed (PSG2-4). The rate shall cover the cost of all materials, labour and plant required to construct each type of joint specified on the drawings, including the cost of all shuttering, treatment of the joint as specified in Subclause 5.5.7.3, the provision of chamfers as specified where concrete is exposed, as well as testing and repairing where necessary.

Non-designated joints will not be measured for payment.

PSG8.4 Formed joints

Formed joints will be measured by the plan area of the joint.

The rates shall cover the cost of all operations and materials specified in Subclause 5.5.7 and PSG5-4,2, and detailed on the drawings such as joint filler, dowel bars and tubes, bitumen coats, etc, but excluding water stops or water bars. Water stops and water bars will be measured by length separately for each type.

PSG8.5	Formwork
PSG8.5.1	Edges of Blinding Layer <p>No separate payment will be made for formwork to the edge of the blinding layer. The rates tendered for concrete to be blinding layer shall cover the cost of such formwork.</p>
PSG8.5.2	Kickers <p>Formwork to the edges of kickers will be measured as plain vertical or plain circular as applicable (not as narrow widths).</p>
PSG8.6	Unformed Surface Finishes (Subclause 8.4.4) <p>The rates for unformed surface finishes shall cover the cost of providing the respective surface finish as specified in PSG5-6.</p>
PSG8.7	Holding Down Bolts <p>Fixing of holding down bolts will be measured by number. The rate shall cover the cost of all things necessary to ensure that the bolts are effectively and rigidly held in position during casting, complete with sleeved pockets, all as detailed on the drawings.</p>
PSG8.8	Grouting <p>Grouting of base plates and equipment bases will be measured by the volume of grout used.</p> <p>The rate shall cover the cost of the supply and floating in the grout under the plates to ensure solid and complete filling of the gap.</p>
PSG8.9	Items cast in concrete <p>Items cast in concrete will be measured by number separately for each type of item.</p> <p>Notwithstanding Sub clause 8.2.6, the rate shall cover the cost of fixing in position and casting in the item as construction proceeds, irrespective of whether the Contractor chooses to fix the item in the formwork and cast it in directly or to box out a hole and group the item in subsequently.</p> <p>The item will be measured and paid separately.</p>
PSH	STRUCTURAL STEEL WORK (SANS 1200 H)
PSH3	Materials
PSH3-1	Structural Steel. (Sub-clause 3.1.1) <p>Grade S355JR steel shall be used for all structural steelwork.</p>
PSH3-3	Bolts <p>All nuts, bolts and washers used shall be of ISO Metric Grade 8.8 mild steel unless otherwise specified as per SABS 135 :1989.</p>
PSH5	Construction
PSH5-1	Welders (Sub-clause 5.3.5) <p>All welding shall be done by, or under the direct supervision of coded welders.</p>
PSH5-2	Shop Details <p>The Contractor shall provide shop details, in terms of Sub-clause 5.1.2, for the steel superstructure units. The drawings shall be submitted for approval at least 2 weeks prior to commencement of fabrication.</p>

PSH5-3	Protective Treatment (Sub-clause 5.3.9)
PSH5-3.1	Corrosion protection Corrosion protection shall be in accordance with SABS 1200 HC as amended in PSHC 5.
PSH5-4	Erection of Steel Columns The steel columns shall be accurately aligned and leveled using a system of locking units to hold the columns in their correct positions.
PSH8	Measurement and Payment
PSH8-1	Structural Steelwork and Corrosion Protection Handrails, Walkways and ladders will be measured separately by number, length or area, as scheduled. Structural steelwork will be measured and paid by lump sum. The rates tendered shall include for the production of shop drawings, supply, fabrication, corrosion protection, transportation and erection of the structural steelwork and crawl beams. All plant, labour and materials necessary for the proper completion of the structural steelwork, including fixing it to the concrete plinths, shall be included.
PSL	MEDIUM-PRESSURE PIPELINES (SANS 1200 L)
PSL3	MATERIALS
PSL3.1	General The water pipeline shall be the blue uPVC type, class 9 (9 bar) with rubber joints (Z-joints). “No joints may be glued or welded” ; Proof of SANS certificates must be provided beforehand in which the quality of the pipes is confirmed. Quantities of different types and classes of pipe must be confirmed with the Engineer before final quantities are ordered.
PSL3.3	STEEL-, CAST IRON AND METAL PIPES AND SPECIALS
PSL3.3.1	General The working pressure for a special shall not be less than the highest working pressure in any adjacent pipe or fitting. All steel, cast iron and metal parts of pipes and fittings which are installed underground must be wrapped with “Denso inner and outer uPVC tape” or similar approved material which is approved by the Engineer. All steel pipe pieces which are provided with screw-thread must be produced from stainless steel type 316. All steel pipes and steel accessories shall be “hot dip galvanised” as by the standard SANS 763 specifications prescribed.
PSL3.8.3	Flanges and Accessories Add the following: Flanges shall comply with SABS 1123 and have a minimum working pressure of 1 600 kPa, except where otherwise indicated. Holes shall be drilled to Table 16 SABS 1123. Any item of pipe work or special or valve, of which the flanges are incorrectly drilled, will be rejected. The reaming of bolt-holes to oversized dimensions to enable a particular item to fit will not be allowed. All flanges shall be provided complete with bolts, nuts, washers and rubber O-rings or fibre insertions, as appropriate. Compressed asbestos fibre insertions shall be not less than 1, 5 mm thick and shall comply with BS 2815 Grade B.

PSL3.8.4 **Loose Flanges**

Add the following:

"Bolts and nuts must be of electroplated steel type and must comply with the applicable requirements of SANS 135."

PSL4 **PLANT**

PSL 4.3 **TESTING**

PSL 4.3.1 Add the following:

The contractor must see to it that all test apparatus must be in a safe working condition. Calibration certificates of the pressure meters must be provided before any tests are accepted. The contractor must make his own arrangements to get water for testing. All water costs for testing purposes must be included in the rate for the installation of the pipes.

PSLB **BEDDING (PIPES) (SANS LB)**

PSLB3 **MATERIALS**

PSLB3.1 **Bedding (Sub Clause 3.3)**

The bedding will be of the Class C type. Bedding and Blanket materials will only be imported if the materials from excavation are not suitable.

PSLB8 **MEASUREMENT AND PAYMENT**

PSLB8.1 **Volume of bedding material (Sub Clause 8.1.3)**

The volume of imported bedding material will be measured net, excluding the volume occupied by the pipe.

NAMA-KHOI MUNICIPALITY

BID/NC062/03/2023/2023

PROJECT NO.35008.00/2023/01

REFURBISHMENT OF NABABEEP WASTE WATER TREATMENT WORKS

C3.3.3 PARTICULAR SPECIFICATIONS

C3.3.3.1	PM:	MASONRY
C3.3.3.2	SPEC BVMECH01:	GENERAL
C3.3.3.3	SPEC BVMECH01/4:	CORROSION PROTECTION
C3.3.3.4	SPEC BVMECH01/5:	GENERAL METALWORK
C3.3.3.5	SPEC BVMECH01/6:	MEDIUM PRESSURE PIPEWORK AND VALVES
C3.3.3.6	SPEC BVMECH01/7:	CHEMICAL DOSING EQUIPMENT AND STORAGE TANKS
C3.3.3.7	SPEC BVELEC01/0:	GENERAL TECHNICAL SPECIFICATIONS (ELECTRICAL)
C3.3.3.8	SPEC BVELEC01/1:	ELECTRICAL QUALITY SPECIFICATION
C3.3.3.9	SPEC BVELEC01/2:	LAYING OF CABLES AND EXCAVATIONS
C3.3.3.10	SPEC BVELEC01/3:	EARTHING
C3.3.3.11	SPEC BVELEC01/4:	MOTOR CONTROL CENTERS (GENERAL)

PM MASONRY

PM 1 Scope

Materials, construction method and workmanship desired for masonry are explained in this section. All activities in connection with masonry and plaster of structures are treated.

PM 2 Material

The building-sand for mortar must comply with specification for sand for concrete, on condition that all the sand can be screened through a 2,4mm screen.

The cement for mortar must comply with the same specification as for cement in concrete.

Quality bricks should be thoroughly burnt to be hard and durable. A hard ringing sound emitted when two bricks are struck together, indicates that bricks were well burnt. The bricks should be true to size and shape, with straight edges and even surfaces. Bricks must comply with the requirements as stipulated in the latest edition of SABS 227.

Platforms for mixing, wheel barrows and pans which come in contact with the mortar must be clean, watertight and none absorbed before any mortar is placed on or in it.

PM 3 Brickwork

All brickwork must be done in English Bond and no false headers may be used.

Bricks must be soaked in water before immediate use and the previous layer must also be well wet before the next layer is mortared. Bricks must be well embedded in the mortar and all the joints of each layer of bricks must be well cocked. Joints may under no circumstances be thicker than 10mm and all vertical joint and corners must be plumb.

PM 4 Mortar

Measurements for mixing of mortar must be done volume units. Five units of sand to one unit of Portland cement for masonry and plaster of walls and three units of sand to one unit of Portland cement for the plaster of concrete ceilings and beams, if not otherwise stipulated.

The ingredients must be dry mixed until the mixture is uniform in colour and appearance. There after water must be added with fine spray and the ingredients must be thoroughly mixed.

C1.4.5.1 HEALTH AND SAFETY SPECIFICATION

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SPEC BVH&S000	DEFINITIONS AND ABBREVIATIONS
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SPEC BVH&S002	SCOPE OF WORK
SPEC BVH&S003	THE PRINCIPAL CONTRACTOR'S GENERAL DUTIES
SPEC BVH&S004	OCCUPATIONAL HEALTH & SAFETY MANAGEMENT
SPEC BVH&S005	PROJECT/SITE SPECIFIC REQUIREMENTS

SPEC BVH&S000 DEFINITIONS AND ABBREVIATIONS

"Act" –means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

"Agent" –means a competent person who acts as a representative for a client;

"Client" –means any person for whom construction work is performed;

"Construction manager" means a competent person responsible for the management of the physical construction processes and the coordination, administration and management of resources on a construction site;

"Construction site" means a work place where construction work is being performed;

"Construction supervisor" means a competent person responsible for supervising construction activities on a construction site;

"Construction work" means any work in connection with -

- (a) the erection, maintenance, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure;
- (b) the installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling;
- (c) the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work;

"Contractor" –means an employer, as defined in section 1 of the Occupational Health and Safety Act, who performs construction work and includes principal contractors;

"Designer" means-

- (a) a competent person who-
 - (i) prepares a design;
 - (ii) checks and approves a design;
 - (iii) arranges for a person at work under his or her control to prepare a design, including an employee of that person where he or she is the employer; or
 - (iv) designs temporary work, including its components;
- (b) an architect or engineer contributing to, or having overall responsibility for a design;
- (c) a building services engineer designing details for fixed plant;
- (d) a surveyor specifying articles or drawing up specifications;
- (e) a contractor carrying out design work as part of a design and building project; or an interior designer, shop-fitter or landscape architect;

"Health and Safety File" –means a file, or other record containing the information by the Construction Regulations;

"Health and Safety Plan" –means a site, activity or project specific documented plan in accordance with the client's health and safety specification;

"Health and Safety Specification" –means a site, activity or project specific document prepared by the client pertaining to all health and safety requirements related to construction work;

"Method Statement" –means a document detailing the key activities to be performed in order to reduce as reasonably as practicable the hazards identified in any risk assessment;

"Principal contractor" –means an employer appointed by the client to perform construction work;

"Risk Assessment" –means a program to determine any risk associated with any hazard at a construction site, in order to identify the steps needed to be taken to remove, reduce or control such hazard.

SPEC BVH&S001 BACKGROUND

This part of the specification has the objective to assist principal contractors entering into contracts with Prince Albert Municipality that they comply with the Occupational Health and Safety (OH&S) Act, No. 85 of 1993.

Compliance with this document does not release the principal contractor from complying with minimum legal requirements and the principal contractor remains accountable for the health and safety of his employees and those of his mandatories. Principal and other contractors should therefore insist that this portion of the specification form part of any contract that he may have with other contractors and/or suppliers.

This section is the health and safety specification that addresses all aspects of occupational health and safety as affected by this contract. It provides the requirements that principal contractors and other contractors shall comply with in order to reduce the risks associated with this contract that may lead to incidents causing injury and/or ill health.

The Occupational Health and Safety Act, 1993 (Act No 85 of 1993) together with its applicable Regulations ('the Act') forms part of this Health and Safety Specifications. Any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned to it unless the context otherwise indicates.

2.1 GENERAL DESCRIPTION OF WORKS:

The NAMA KHOI MUNICIPALITY intendS to upgrade its Nababeep Wastewater Treatment Plant in Nababeep. This contract comprises Civil, Mechanical and Electrical Works. The Contract entails the following:

- Construction of a new reinforced concrete structure to accommodate two Archimedes Screw Lifting Pumps
- Construction of a new reinforced concrete above-ground Inlet works, comprising hand-raked screens, grit channels and a flow measuring facility.
- Demolition of existing primary pump station top structure and refurbishment of two self-priming lift pumps complete with piping and switchgear.
- Refurbishment of several reinforced concrete structures such as Clarigesters, Biological Filter basins, Clarifiers, etc. (crack repairs, sealing, etc)
- Refurbishment of Mechanical equipment on Clarigesters such as scraper reduction gearboxes, scrapers, flame arrestors and sludge pumps.
- Refurbishment of Mechanical equipment on Biological Filtration Units such as central rotating distributors, replacement of stone media, etc.
- Refubishment of Mechanical equipment on Clarifiers such as scraper reduction gearboxes, scrapers and sludge pumps.
- Replacement of Chemical Dosing system for Chlorine dosing using a Calcium Hypochlorite solution
- Replacement of the Treated Effluent Pressure Filters and discharge pump station.
- Convert the current 520V Electrical power supply system to a 400V 3-phase electrical system.
- Replacement of all Electrical switchgear for pumps, geraed motors, etc complete with cables, eathing, site lighting, etc.

• **SPEC BVH&S003** **THE PRINCIPAL CONTRACTOR'S GENERAL DUTIES**

The Principal Contractor's general duties in terms of this Health and Safety Specification are, but not limited to, the following:

7. (1) A principal contractor must-

(a) provide and demonstrate to the client a suitable, sufficiently documented and coherent site-specific health and safety plan, based on the client's documented health and safety specifications contemplated in regulation 5(1)(b), which plan must be applied from the date of commencement of and for the duration of the construction work and which must be reviewed and updated by the principal contractor as work progresses;

(b) open and keep on site a health and safety file, which must include all documentation required in terms of the Act and these Regulations, which must be made available on request to an inspector, the client, the client's agent or a contractor; and

(c) on appointing any other contractor, in order to ensure compliance with the provisions of the Act-

(i) provide contractors who are tendering to perform construction work for the principal contractor, with the relevant sections of the health and safety specifications contemplated in regulation 5(1)(b) pertaining to the construction work which has to be performed;

(ii) ensure that potential contractors submitting tenders have made sufficient provision for health and safety measures during the construction process;

(iii) ensure that no contractor is appointed to perform construction work unless the principal contractor is reasonably satisfied that the contractor that he or she intends to appoint, has the necessary competencies and resources to perform the construction work safely;

(iv) ensure prior to work commencing on the site that every contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer as contemplated in the Compensation for Occupational Injuries and Diseases Act, 1993;

(v) appoint each contractor in writing for the part of the project on the construction site;

(vi) take reasonable steps to ensure that each contractor's health and safety plan contemplated in subregulation (2)(a) is implemented and maintained on the construction site;

(vii) ensure that the periodic site audits and document verification are conducted at intervals mutually agreed upon between the principal contractor and any contractor, but at least once every 30 days;

(viii) stop any contractor from executing construction work which is not in accordance with the client's health and safety specifications and the principal contractor's health and safety plan for the site or which poses a threat to the health and safety of persons;

(ix) where changes are brought about to the design and construction, make available sufficient health and safety information and appropriate resources to the contractor to execute the work safely; and

(x) discuss and negotiate with the contractor the contents of the health and safety plan contemplated in subregulation (2)(a), and must thereafter finally approve that plan for implementation;

- (d) ensure that a copy of his or her health and safety plan contemplated in paragraph (a), as well as the contractor's health and safety plan contemplated in subregulation (2)(a), is available on request to an employee, an inspector, a contractor, the client or the client's agent;
- (e) hand over a consolidated health and safety file to the client upon completion of the construction work and must, in addition to the documentation referred to in subregulation (2)(b), include a record of all drawings, designs, materials used and other similar information concerning the completed structure;
- (f) in addition to the documentation required in the health and safety file in terms of paragraph (c)(v) and subregulation (2)(b), include and make available a comprehensive and updated list of all the contractors on site accountable to the principal contractor, the agreements between the parties and the type of work being done; and
- (g) ensure that all his or her employees have a valid medical certificate of fitness specific to the construction work to be performed and issued by an occupational health practitioner in the form of Annexure 3.

(2) A contractor must prior to performing any construction work-

- (a) provide and demonstrate to the principal contractor a suitable and sufficiently documented health and safety plan, based on the relevant sections of the client's health and safety specification contemplated in regulation 5(1)(b) and provided by the principal contractor in terms of subregulation (1)(a), which plan must be applied from the date of commencement of and for the duration of the construction work and which must be reviewed and updated by the contractor as work progresses;
 - (b) open and keep on site a health and safety file, which must include all documentation required in terms of the Act and these Regulations, and which must be made available on request to an inspector, the client, the client's agent or the principal contractor;
 - (c) before appointing another contractor to perform construction work be reasonably satisfied that the contractor that he or she intends to appoint has the necessary competencies and resources to perform the construction work safely;
 - (d) co-operate with the principal contractor as far as is necessary to enable each of them to comply with the provisions of the Act; and
 - (e) as far as is reasonably practicable, promptly provide the principal contractor with any information which might affect the health and safety of any person at work carrying out construction work on the site, any person who might be affected by the work of such a person at work, or which might justify a review of the health and safety plan.
- (3) Where a contractor appoints another contractor to perform construction work, the duties determined in subregulation (1)(b) to (g) that apply to the principal contractor apply to the contractor as if he or she were the principal contractor.
- (4) A principal contractor must take reasonable steps to ensure co-operation between all contractors appointed by the principal contractor to enable each of those contractors to comply with these Regulations.
- (5) No contractor may allow or permit any employee or person to enter any site, unless that employee or person has undergone health and safety induction training pertaining to the hazards prevalent on the site at the time of entry.

(6) A contractor must ensure that all visitors to a construction site undergo health and safety induction pertaining to the hazards prevalent on the site and must ensure that such visitors have the necessary personal protective equipment.

(7) A contractor must at all times keep on his or her construction site records of the health and safety induction training contemplated in subregulation (6) and such records must be made available on request to an inspector, the client, the client's agent or the principal contractor;.

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

SPEC BVH&S004 OCCUPATIONAL HEALTH & SAFETY MANAGEMENT

4.1 Structure and Organization of OH&S Responsibilities

4.1.1 Overall Supervision and Responsibility for OHS

- The Client to ensure that the Principal Contractor, is appointed in terms of Construction Regulation 5(1)(k), implements and maintains the agreed and approved OH&S Plan.
- The Chief Executive Officer of the Principal Contractor in terms of Section 16 (1) of the Act to ensure that his Employees (as defined in the Act) complies with the Act. Legal Compliance Audit may be used for this purpose.
- Any OH&S Act (85 /1993), Section 16 (2) appointee/s as detailed in his/her/their respective appointment forms
- The Construction Manager, Assistant Construction Manager, Supervisor and Assistant Construction Supervisor/s to be appointed in terms of Construction Regulation 8.
- A Full-Time Safety Officer must be appointed in terms of Construction Regulation 8 and must be registered with the SACPCMP

4.1.2 Additional (Specific) Responsibilities for OHS

The contractor shall note that it is a generic list only and is intended for use as a guideline.

<u>Appointment</u>	<u>Section/Regulation</u>
OH&S Committee	(OHS Act Section 19)
OH&S Representatives	(OHS Act Section 17)
Construction Manager	(Construction Regulation 8(1))
Construction Supervisor	(Construction Regulation 8(7))`
Construction Health and Safety Officer	(Construction Regulation 8(5))
Risk Assessor	(Construction Regulation 9)
Fall Protection Plan Developer	(Construction Regulation 10)
Structures Supervisor/Inspector	(Construction Regulation 11)
Temporary Works Supervisor	(Construction Regulation 12)
Excavation Supervisor	(Construction Regulation 13)

Scaffolding Supervisor	(Construction Regulation 16)
Scaffolding Inspector / Erector	(Construction Regulation 16)
Bulk Mixing Plant Supervisor	(Construction Regulation 20)
Crane Inspector	(Construction Regulation 22)
Construction Vehicles/Mobile Plant Supervisor	(Construction Regulation 23)
Drivers/Operators of Construction Vehicles/Plant	(Construction Regulation 23)
Electrical Installation and Appliances Inspector	(Construction Regulation 24)
Emergency/Security/Fire Coordinator	(Construction Regulation 29)
Fire Equipment Inspector	(Construction Regulation 29)
Water Environment Supervisor	(Construction Regulation 26)
Housekeeping Supervisor	(Construction Regulation 27)
Stacking & Storage Supervisor	(Construction Regulation 28)
Pressure Equipment Supervisor	(Pressure Equipment Regulation)
First Aider	(General Safety Regulation 3)
Ladder Inspector	(General Safety Regulation 13A)
Incident Investigator	(General Admin Regulation 9)
Machinery Supervisor	(General Machinery Regulation 2)
Hazardous Chemical Substances Supervisor	(HCS Regulations, CR 25)

Above appointments shall be in writing and the responsibilities clearly stated together with the period for which the appointment is made. This information shall be communicated and agreed with the appointees.

The principal contractor shall, furthermore, provide Prince Albert Municipality with an organogram of all contractors that he/she has appointed or intends to appoint and keep this list updated and prominently displayed on site.

4.2 Communication & Liaison

- 4.2.1 OH&S Liaison between the Employer, the Principal Contractor, the other Contractors, the Designer and other concerned parties shall be through the H&S Committee as per the procedures determined by the H&S Committee.
- 4.2.2 In addition to the above, communication may be directly to the Client or his appointed Agent, verbally or in writing, as and when the need arises.
- 4.2.3 Consultation with the workforce on OH&S matters will be through their Supervisors and H&S Representatives ('SHE – Reps')
- 1.2.4 The Principal Contractor will be responsible for the dissemination of all relevant OH&S information to the other Contractors e.g. design changes agreed with the Client and/or its Agent on its behalf and the Designer, instructions by the Client and/or his/her agent, exchange of information between Contractors, the reporting of hazardous/dangerous conditions/situations etc.

4.3 OH&S File

The Principal Contractor must, in terms of Construction Regulation 7(1)(b), keep a health & safety file on site at all times that must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors on site that are accountable to the Principal Contractor and the agreements between the parties and details of work being done.

4.3.2 The following documents must inter alia be kept in the OH&S file:

- Construction Work Permit (Construction Regulation 3.)
- Copy of Principal Contractor's Health & Safety Plan
- Copy of OH&S Act (updated) (General Administrative Regulation 4.)
- Proof of Registration and good standing with a COID Insurer - Construction Regulation 5(1)(j)
- OH&S Plan agreed with client including the underpinning Risk Assessment/s & Method Statements (Construction regulation 5(1)(l))
- Designs/drawings (Construction Regulation 6&7)
- A list of Contractors (Sub-Contractors) including copies of the agreements between the parties and the type of work being done by each Contractor (Construction Regulation 7)
- Appointment/Designation forms as per 4.1.2 above & as per OHS Act.
- Competency Certificates
- Occupational Medical Certificates of all personnel working on site to proof Fitness to work
- Registers as follows:
 - Accident/Incident Register
 - Annexure 1 of the General Administrative Regulations
 - OH&S Representatives Inspection Register
 - Temporary Works
 - Excavations Inspection
 - Water Environment Inspections
 - Fall Protection / Prevention Equipment
 - Arc & Gas Welding & Flame Cutting Equipment Inspections
 - Construction vehicles & Mobile Plant Inspections
 - Electrical Installation and –Machinery Inspections
 - Fire Equipment Inspection & Maintenance
 - Lifting Tackle and Equipment Inspections
 - Inspection of Lifting Machinery
 - Inspection of Ladders
 - Inspection of Pressure Equipment
 - First Aid Boxes
 - Personal Protective Equipment
 - Portable Electrical Equipment
 - Pressure Equipment
 - Hand Tools

4.4. OHS Goals and Objectives and Arrangements for Monitoring and Review of OHS Performance

The Principal Contractor is required to maintain an acceptable disabling incident frequency rate (DIFR) and report on this to the Client and/or its Agent on its behalf on a monthly basis.

4.5. Identification of Hazards and Development of Risk Assessments, Standard Working Procedures (SWP) and Method Statements

The Principal Contractor is required to develop Risk Assessments, Standard Working Procedures (SWP) and Method Statements for each activity executed in the contract or project (See Section 5 below "Project/Site Specific Requirements")

4.6. Arrangements for Monitoring and Review

4.6.1. *Monthly Audit by Client*

The Client and/or Agent on its behalf will be conducting monthly Audits to comply with Construction Regulation 5(1)(o) to ensure that the principal Contractor has implemented and is maintaining the agreed and approved OH&S Plan.

4.6.2. *Other Audits and Inspections by Client*

The Client and/or Agent reserve the right to conduct other ad hoc audits and inspections as deemed necessary.

4.6.3. A representative of the Principal Contractor must accompany the Client and/or Agent on all Audits and Inspections and may conduct his/her own audit/inspection at the same time. Each party will, however, take responsibility for the results of his/her own audit/inspection results.

4.6.4. *Reports*

4.6.4.1 The Principal Contractor is required to provide the Client with a monthly report.

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

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

or where:

- a major incident occurred
- the health or safety of any person was endangered
- where a dangerous substance was spilled
- the uncontrolled release of any substance under pressure took place
 - machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- machinery ran out of control to the Provincial Director of the Department of Labour within seven days. (Section 24 of the Act & General Administrative Regulation 8.)

4.6.4.3. The Principal Contractor is required to provide the Client with copies of all statutory reports required in terms of the Act. The Principal Contractor is required to provide the Client with copies of all internal and external accident/incident investigation reports.

4.6.5. *Review*

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

4.6.5.2 The Principal Contractor must provide the Client, other Contractors and all other concerned parties with copies of any changes, alterations or amendments.

4.7 Site Rules and other Restrictions

4.7.1 *Site OH&S Rules*

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

4.7.2. *Security Arrangements*

4.7.2.1 The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period. Access control must include the rule that non-employees will not be allowed on site unaccompanied.

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

4.7.2.3 The Principal Contractor must appoint a competent Emergency Controller who must develop emergency contingency plans for any emergency that may arise on site as indicated by the risk assessments. These must include a monthly practice/testing programme for the plans e.g. January: trench collapse, February: Falling from heights, etc. and practiced/tested with all persons on site at the time, participating.

4.8 Training

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

4.8.1 *General Induction Training*

All employees of the Principal and other Contractors to be in possession of proof of General Induction training

4.8.2 *Site Specific Induction Training*

All employees of the principal and other Contractors to be in possession of Site Specific OH&S Induction training.

4.8.3 *Other Training*

4.8.3.1 All operators, drivers and users of construction vehicles, mobile plant and other equipment to be in possession of Competency Certificates & Medical Certificates of Fitness (Construction Regulation 23).

4.8.3.2 All employees in jobs requiring training in terms of the Act and Regulations to be in possession of valid proof of training.

4.8.3.3 OH&S Training Requirements: (as required by the Construction Regulations and as indicated by the OH&S Specification & the Risk Assessment/s):

- General Induction (Section 8 of the Act)
- Site/Job Specific Induction (also visitors) (Sections 8 & 9 of the Act)
- Site/Project Manager
- Construction Supervisor
- Health and Safety Officer
- OH&S Representatives (Section 18 (3) of the Act)
- Training of the Appointees
- Working near or on water

- Operation of Cranes (Driven Machinery Regulations 18 (11))
- Operators & Drivers of Construction Vehicles & Mobile Plant (Construction Regulation 23)
- Basic Fire Prevention & Protection (Environmental Regulation 9 and Construction Regulation 29)
- Basic First Aid (General Safety Regulations 3)
- Storekeeping Methods & Safe Stacking (Construction Regulation 28)
- Emergency, Security and Fire Co-ordinator
- Work and appointment Related training

4.9. Accident and Incident Investigation

- 4.9.1 The Principal Contractor is responsible for the investigation of all accidents/incidents where employees and non-employees were injured to the extent that he/she/they had to be referred for medical treatment by a doctor, hospital or clinic. (General Administrative Regulation 9)
- 4.9.2. The results of the investigation to be entered into the Accident/Incident Register Annexure 1) (General Administrative Regulation 9)
- 4.9.3. The Principal Contractor is responsible for the investigation of all non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.
- 4.9.4. The Principal Contractor is responsible for the investigation of all accidents on Construction Site and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

4.10 OHS Representatives and Committees

4.10.1 *Designation of OHS Representatives*

4.10.1.1 Where the Principal Contractor employs more than 20 persons (including the employees of other Contractors (sub-contractors)) he has to appoint one OHS Representatives for every 50 employees or part thereof. General Administrative Regulation 6 requires that the appointment OR election and subsequent designation of the OHS Representatives are executed in consultation with Employee Representatives or Employees. (Section 17 of the Act and General Administrative Regulation 6 & 7.)

4.10.1.2 OHS Representatives have to be designated in writing and the designation must include the area of responsibility of the person and term of the designation.

4.10.2 Duties and Functions of the OHS Representatives

4.10.2.1 The Principal Contractor must ensure that the designated OHS Representatives conduct a minimum monthly inspection of their respective areas of responsibility using a checklist and report thereon to the Principal Contractor.

4.10.2.2 OHS representatives must be included in accident/incident investigations.

4.10.2.3 OHS representatives must attend all OHS committee meetings.

4.10.3. Appointment of OHS Committee

4.10.3.1 The Principal Contractor must establish an OHS Committee consisting of all the designated OHS Representatives together with a number of management representatives that are not allowed to exceed the number of OHS representatives on the committee. The members of the OHS committee must be appointed in writing.

4.10.3.2. The OH&S Committee must meet minimum monthly and consider, at least, the following Agenda:

- 1) Opening
- 2) Previous Minutes
- 3) Observations
- 4) Program and Safety considerations
- 5) Occupational Health
- 6) Housekeeping improvement
- 7) Occupational Hazards / Risks on Project
- 8) Incidents & Accidents / Injuries
- 9) Equipment Registers
- 10) Safety performance Evaluations
- 11) Occupational Hygiene monitoring and measuring
- 12) Education & Safety promotion program
- 13) General
- 14) Date of Next Meeting
- 15) Closing

4.11 Occupational Medicals – Principal Contractor must ensure that all employees have a valid medical certificate of fitness specific to the construction work to be performed and issued by an occupational health practitioner as per Annexure 3 of Construction Regulation, 2014 - Construction Regulation 7(1)(g)

SPEC BVH&S005 PROJECT/SITE SPECIFIC REQUIREMENTS

5.1 The following is a list of specific activities and considerations that have been identified for the project and site and for which Risk Assessments, Standard Working Procedures (SWP), management and control measures and Method Statements (where necessary) have to be developed by the Principal Contractor:

- Clearing and Grubbing
- Earthworks
- Site Establishment
 - Offices
 - Secure / safe storage for materials, plant and equipment
 - Ablutions & Sheltered eating areas
 - Vehicle access to the site
- Location & Dealing with existing structures
- Installation and Maintenance of temporary construction electrical supply
- Adjacent land uses / surrounding property exposures
- Boundary and access control public liability exposures
- Health risks arising from neighbouring as well as own activities
- Exposure to noise & vibration
- Protection against dehydration and heat exhaustion
- Protection from wet and cold conditions
- Dealing with HIV/Aids and other diseases
- Use of portable electrical equipment
- Excavations including:
 - Ground/soil conditions
 - Trenching
 - Shoring
 - Drainage
 - Daily inspections
- Welding
- Loading and offloading of trucks
- Aggregate/Sand and other Materials Delivery
- Driving and operation of construction and mobile plant
- Mobile cranes and the ancillary lifting tackle
- Use and storage of flammable liquids and other hazardous substances
- Layering and bedding of trench floor
- Installation of Pipes in trenches
- Installation of bends, valves, air valves, non-return valves etc. as per bill of quantities, drawings, and specifications,
- As discovered by the principal contractors hazard identification exercise
- As discovered from any inspections and audits conducted by the client or by the principal contractor or any other contractor on site.

- As discovered from any accident / Incident Investigation

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

1. Administrative & Legal Requirements
2. Education, Training & Promotion
3. Public Safety & Emergency Preparedness
4. Personal Protective Equipment
5. Housekeeping
6. Scaffolding, Formwork & Support work
7. Ladders
8. Electrical Safeguarding
9. Emergency/Fire Prevention & Protection
10. Excavations & Demolition
11. Tools
12. Cranes
13. Personnel & Material Hoists
14. Transport & Materials Handling
15. Site Plant & Machinery
16. Plant & Storage Yards/Site Workshops Specifics
17. Health & Hygiene

SPEC BVMECH01: GENERAL

CONTENTS

- 1. SCOPE**
- 2. INTERPRETATIONS**
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- 4. PLANT**
- 5. INSTALLATION AND COMMISSIONING**
- 6. TOLERANCES**
- 7. TESTING**
- 8. MEASUREMENT AND PAYMENT**

APPENDIX A. APPLICABLE STANDARDS

SPEC BVMECH01 : GENERAL

1. SCOPE

This specification covers the requirements for the supply, delivery, installation, testing and commissioning of mechanical and electrical equipment forming part of civil engineering construction works.

2. INTERPRETATIONS

Definitions

For the purposes of this specification the following definitions shall apply:

a) General

Acceptable/Approved (Approval) - Acceptable to/approved (approval) by the Engineer.

Authorized/ordered/rejected - Authorized/ordered/rejected by the Engineer.

Designated - Shown on a drawing, or otherwise specified by the Engineer or, in relation to an item scheduled in the tender document, descriptive of an item to be priced by a tenderer.

Instructed/ directed/ permitted - Instructed/directed/ permitted by the Engineer.

Satisfactory- Capable of fulfilling or having fulfilled the intended function.

Service - Any pipeline, duct, cable, or overhead wire for conveying, as appropriate, any liquid or gas, or electricity for lighting or power or telecommunication transmissions.

Submitted - Submitted with the tender or submitted to the Engineer, as appropriate.

b) Tolerances

Deviation. The difference between the actual (i.e. measured) size or position and the specified size or position.

Tolerance. The range between the limits within which a size or position shall lie.

NOTE: A tolerance is an absolute value without a sign but the dimension or axis to which it applies must be stated.

c) Measurement and payment

Schedule - The Schedule of Quantities.

Schedule rate - The unit rate or price entered in the schedule at which the Contractor undertakes to execute the particular work or to provide the required material, article, or service, or to do any or all of these things, as set out in the item concerned.

Scheduled - Listed in the Schedule of Quantities.

No limitation by description

Nothing appearing in the specification or Schedule of Quantities shall limit the obligations and liabilities of the Contractor, the Engineer, or the Employer under the conditions of contract.

Approval

No approval or acceptance of any material or equipment and its operation, or of any installation procedure to be used, or of any Contractor's drawings or instructions, will imply any relaxation of the requirements governing the quality of the materials or of the finished work, or relieve the Contractor of his responsibilities under the Contract.

Specification drawings

Where reference to a drawing is used in place of a written requirement, the drawing shall be deemed to form part of the specification.

Items in Schedule of Quantities

The rate or price tendered by the Contractor for a scheduled item shall be deemed to cover the Contractor's profit plus the cost to him of all labour, materials, plant, equipment and facilities required

by him to carry out the operations or activities required by the applicable standard specification or in the measurement and payment clause of the Project Specification.

The Contractor's charges for completing a preliminary and general item scheduled in the Schedule of Quantities, shall be interpreted to be his rate or price to cover his direct costs plus overheads, and to include his profit and all costs and expenses that he requires for the item specified and for all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based.

3. DESIGN, MATERIALS AND MANUFACTURE (SUPPLY AND DELIVERY)

Standards

The materials and workmanship throughout shall be of the highest quality generally accepted in the manufacturing and/or construction industry. All inferior work will be rejected.

Where available, all materials used and the standards of workmanship employed for the execution of the Works shall comply with the appropriate SABS, IEC, ISO or BS Standard and/or Code and if such material is available with an official standard mark, the material shall bear such mark.

Occupational Health and Safety Act

All apparatus and material supplied and all work carried out shall comply in all respects with Act No. 85.

Electrical work

All electrical equipment, materials and the installation thereof shall comply with the relevant clauses of the following, as applicable:

- a) The South African Code of Practice for the Wiring of Premises - SANS 10142-1.
- b) The Post Office Act No. 44.
- c) The Standard Electricity Supply By-Laws of Local Authorities and appropriate additional By-Laws or Regulations.

Holding down bolts, pipes, etc. to be concreted in

The Contractor shall supply and deliver all holding down bolts, pipes and other metal work that are to be concreted in.

Defective items

Any parts or items found to be defective shall be replaced or repaired at the Contractor's expense, to the Engineer's approval.

Interim Storage

If the Engineer gives notice that physical delivery to the point stated in the Project Specification is temporarily inadvisable, delivery shall be delayed until authorised by the Engineer. The giving of such notice shall not relieve the Contractor of any obligations undertaken by him in regard to physical delivery at the point stated in the Project Specification but, as an interim measure, for the purpose of vesting ownership of such goods in the Employer, the Engineer will either

- a) order the Contractor to deliver the goods to the Employer at:
 - i) the Employer's main store, or
 - ii) a store provided in the vicinity of the Site by the Employer,in which event the Contractor shall so deliver the goods to be stored there at the Contractor's risk

or

b) order the Contractor to store the goods for the Employer in suitable premises provided by the Contractor, in which event the Contractor shall store the goods for the Employer at the Contractor's risk.

Insurance

When any goods are stored in accordance with orders given by the Engineer under, the Contractor shall insure the goods for the benefit of the Employer against all risks whilst they are in storage and shall produce evidence to the satisfaction of the Engineer that the goods are so insured, upon request.

Inspection and vesting of ownership

The Engineer or a person appointed by him will inspect the goods for provisional approval as soon as possible after they are stored in terms of the Engineer's order. Notwithstanding that any of the goods are stored, ownership therein shall pass to and vest in the Employer upon payment therefore.

Transport

Notwithstanding that payment may have been made in respect of transportation of goods to a place of storage, the Contractor shall remain liable for physical delivery of the goods stored to the point stated in the Project Specification.

Storage of goods on Site

In the event of the Engineer not being satisfied with the provisions for storage provided by the Contractor on Site, he may order all goods and erection equipment to be delivered to the Employer's stores and stored therein at the Contractor's risk and cost. Whether goods are stored at the Employer's stores on the order of the Engineer or on the request of the Contractor, the Contractor shall provide all handling and transport to move the goods and erection equipment to the Site of the Works when required.

Tools and spares

As part of the equipment supplied, the Contractor shall supply all special tools or keys required for adjustment to any parts of such equipment. Where ordered by the Engineer, the Contractor shall supply standard spanners and a cabinet to the size and details ordered. The Contractor shall supply such spares, if any, ordered by the Engineer from those listed in the Spares Schedule that forms part of the Detail Sheets.

4. PLANT

Silencing of plant

The Contractor's attention is drawn to Regulation B17 of Chapter III of the regulations framed under Act No. 85. When working in built-up areas, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause an equivalent noise level exceeding 85 dB(A), measured in accordance with SANS 10083, during installation and other work. Alternatively, he shall, by means of barriers, effectively isolate the source of any such noise in order to comply with the said regulations.

5. INSTALLATION AND COMMISSIONING

Penalties and stages of work

The Work is divided into the following stages:

- a) Submission of drawings
- b) Manufacture and delivery of the equipment,
- c) Installation of equipment, and
- d) Testing and commissioning of equipment.

Stage (a) shall be completed within 6 weeks of award. Stages (b), (c) and (d) for each Section of the Schedule of Quantities shall be completed within the period stated in the Appendix to the Tender.

Penalties will be applied at the rate stated in the Appendix to the Tender.

Contractors' drawings and instructions

General

The Contractor shall provide drawings and instructions as applicable. These drawings and instructions shall be submitted to the Engineer and shall be to his satisfaction. In the event of there being no major departure from the layout in the Engineer's drawings, the Contractor's drawings may be prepared as supplementary to the Engineer's drawings.

All drawings and data submitted at tender stage and during the contract period shall be in SI units. All drawings shall be done on ISO 216 A Series finished. Sheet size A1 is preferred. The supply of the original printed or typed documents is preferred, but when copies are made and supplied from original forms these shall be clear and legible and suitable for further duplication. Each complete set of Drawings, instruction manuals, etc. shall be bound in a hard cover lever arch file.

Equipment requiring civil foundations and/or structures

Where the equipment supplied by the Contractor is to be installed on foundations or inside structures to be provided by others, the Contractor shall provide:

- a) Drawings showing the sizes and shapes of civil structures required to house the equipment; the loads imposed by the equipment, and fully dimensioned scale drawings of each item of equipment within 8 weeks of the award of the Contract.
- b) Fully dimensioned drawings showing foundation and fixing bolt positions and sizes and openings to be left in the civil structure to accommodate the equipment, and indicating the position of all water supply points required and the method of operation and control of the equipment, within 12 weeks of the award of the Contract.
- c) Drawings and instructions detailing any work or assistance required from the civil contractor in installing the equipment within 12 weeks of the award of the Contract.

Electrically controlled or operated equipment

Where the goods supplied by the Contractor are to be electrically controlled or operated by equipment provided by others, the Contractor shall provide within 12 weeks of the award of the Contract:

- a) Fully detailed drawings and documentation showing the position and power of all motors, motor characteristics and power points,
- b) full schematic diagrams indicating the interconnection of and the electrical operation of the equipment and details of the electrical motors, etc.

Permanent operating and maintenance instructions

The Contractor shall submit for the Engineer's approval, drafts of the following for each section of equipment:-

- a) Drawings of the equipment detailing all part numbers and materials, and, if required by the Engineer, detailed drawings showing the complete installation.
- b) A complete spares list.
- c) A lubrication and maintenance schedule showing all maintenance and lubrication operations, their recommended frequency and the grades of lubricant required.
- d) A maintenance brochure describing all maintenance, adjustment and replacement procedures.
- e) Operating manual describing the operation of the equipment with performance curves where applicable.
- f) A manual detailing all dismantling and reassembly procedures.
- g) A manual detailing the maintenance procedure for the corrosion protection painting systems.

The instructions shall be written for application to the particular equipment installed and shall be submitted to the Engineer in draft form for approval before being issued to the Site. "Typical" or "Generalised" instructions may be rejected as inadequate. The Contractor shall amplify and amend such drafts until the Engineer is satisfied that they will provide adequate instructions for the Employer's staff to operate and maintain the installation. The drawings shall be up-dated for record purposes to show the installation as built. Once the drafts of all manuals, drawings etc., have been

approved by the Engineer, the Contractor shall prepare three suitably bound copies and one sepia of each drawing and deliver them to the Engineer.

Contractor's programme

Draft programme

Within the time stated in the Appendix to the Tender, the Contractor shall submit to the Engineer for approval a draft proposed programme for the manufacture, installation, testing and commissioning of his equipment.

Final programme

The Contractor, in conjunction with the civil and other contractors, if any, and the Engineer, shall draw up a detailed installation and finishing programme showing the installation, testing and painting of the equipment and structures and the commissioning of the Works.

Should the Contractor deviate from the agreed programme he shall be liable for any costs arising from such deviation.

Water, light and power

Unless otherwise specified, the Contractor shall, at his own cost, make his own arrangements with the local authorities for adequate supplies of water, light and power as may be necessary for every part of the work and he shall bear all costs for openings, connections, meter hire, and any other work necessary for providing such supplies.

Installation of equipment

Safety

The Contractor shall at all times observe proper and adequate safety precautions on the Site in terms of the Contract and Act No. 85.

General

The Contractor shall commence installation within two weeks of notice being received by him from the Engineer. A skilled rigger shall be in charge of the work at all times and any instructions and explanations which the Engineer shall give to him shall be deemed to have been given to the Contractor. The work shall be neat and workmanlike true to line and level, plumb and in proper working order. Where any item of equipment is mounted on a frame or bedplate, packers/shims shall be provided and fitted by the Contractor to ensure accurate alignment.

Where required to correct alignment, all mounted units shall be shimmed with non-corrosive metal shims. Shims shall be the same shape and size as the contact area of the parts and slotted so that the shims can be removed without removing the mounting bolts.

All cut edges shall be without burrs. Shims with wrinkles in the material will not be permitted. Only small lugs shall protrude after completion.

All equipment shall be assembled avoid the development of initial stresses in the materials and to ensure free running of all moving parts.

Concrete pedestals and grouting of bolts, base plates, etc

The construction/modification of the concrete pedestals and foundation blocks for all the equipment will form part of this contract but, unless otherwise specified, the Contractor shall supply the holding down bolts, nuts and washers, templates and/or all dimensions and other details necessary for the construction of the pedestals, foundation blocks, holding down bolt pockets, etc. The Contractor shall satisfy himself that all anchor bolts are firm and that baseplates are fully supported over their whole area and that no voids have been left on the underside of any parts of the baseplates.

Pipes through walls

The building in of, or boxing out for, pipes will form part of the civil section of this contract and the Contractor shall provide all drawings and dimensions necessary for the accurate alignment and positioning of the pipes or boxed out holes.

a) Where pipes are to be built in, the Contractor shall, in good time, provide the pipes and specials which are to be built in, as scheduled.

b) Where holes have been boxed out for pipework, the contractor will be responsible for the grouting in of the pipework.

Before the positioning of the pipework through the holes is commenced the Contractor shall:

- i) arrange to remove all formwork and boxing remaining in the holes.
- ii) make any alterations required to the position and shape of the holes.
- iii) remove all coatings from the outer surfaces of the section of the pipes and specials that passes through the wall to within 25 mm on either side of the wall surfaces, and thoroughly scrape, clean and accurately position them in the respective walls.

The contractor will then grout in (or concrete in where appropriate) the pipes.

Testing and commissioning

General

The equipment shall be tested in accordance with Clause 7 of this specification and shall be commissioned as specified. Commissioning of the Works shall not commence until the Contractor has met the requirements with regards to operations and maintenance manuals as specified. The equipment will not be taken over by the Employer until it has been satisfactorily tested and commissioned.

Commissioning

The Contractor shall be responsible for commissioning the equipment which shall comprise putting it into operation, calibration, proper adjustment of the equipment, and thoroughly running in the whole of the installation after completion. The Contractor shall be responsible for training the Employer's staff with regards to operation and maintenance of the equipment. When all these operations have been carried out to the satisfaction of the Engineer and the installation is operating satisfactorily it will be considered to have been commissioned.

Servicing

Without limiting the liability of the Contractor for remedying defects, the Contractor shall make quarterly visits to the installation during the Defects Liability Period to service and supervise the operation and maintenance of the installed equipment. During these visits he shall make all adjustments and do everything necessary to ensure the proper running of the equipment.

After each servicing visit to the Site the Contractor shall submit to the Engineer a report on:

- a) the condition of the equipment and the servicing work carried out,
- b) the degree to which the operator has become familiar with the equipment.

The last servicing visit shall be carried out during the last week of the Defects Liability Period when the Contractor shall carry out full checks on the equipment to ensure that the alignment, clearances and settings are correct and he shall make any adjustments required to achieve this.

The Final Certificate will not be issued until the last service visit has been carried out to the satisfaction of the Engineer.

6. TOLERANCES

Method of specifying

Tolerances are specified by way of permissible deviations from the designated line or level or standards, as may be applicable.

Degree of accuracy

The Contractor shall construct the various parts of the Works to the degree of accuracy specified in the Project Specification or as shown on the drawings.

7. TESTING

General

The Contractor shall be responsible for the completed installation passing any tests specified or required by the relevant Local Authority or Act No. 85. Where test certificates are required in terms of Specifications or Act No. 85 such certificates shall be submitted to the Engineer after the relevant tests have been completed and before the tested equipment is delivered, installed or commissioned.

Approved laboratories

The testing laboratories of the SABS, CSIR, relevant government departments, local authorities and the Engineer will be deemed to be approved laboratories.

Methods of testing

All testing shall be carried out in strict accordance with the methods specified in the relevant SABS, IEC, ISO or BS specification(s). The Engineer will be entitled to be present at all tests and the Contractor is to give the Engineer sufficient notice of the dates of testing.

Factory tests

The Contractor shall carry out tests in accordance with the requirements of the recognized SASS, SC, ISO or BS standards. Details of the standards used shall be supplied. Additional tests in the manufacturer's works, which the Engineer considers necessary, to determine that the equipment complies with the requirements of the specification, may be called for at no additional cost to the Employer.

Tests on site

All site tests shall be carried out in the presence of the Engineer and at such times as he may require. The Contractor shall satisfy himself by prior testing that the equipment conforms to the specifications. The Contractor shall provide all the relevant test equipment and bear the costs of all testing to be done. The cost of the Engineer's attendance at site tests will be for the Contractor's account if tests fail due to lack of care by the Contractor to ensuring that the equipment conforms to the specifications.

8. MEASUREMENT AND PAYMENT

General

Payment for items scheduled shall conform to the payment clauses of the Conditions of Contract as amended by the following:

- a) Unless scheduled separately, the tendered rates or sums shall cover the cost of drawings and instructions as required.
- b) The tendered rates or sums shall cover the costs of anything not specially mentioned but which an experienced contractor can reasonably foresee as being required to enable the equipment to be installed and function safely and correctly as specified. No claims for extras will be allowed on the grounds that a piece of equipment or a part thereof is not specifically mentioned in the Schedule of Quantities.
- c) The Contractor will not be entitled to any payment until three copies of the Progress Certificate have been submitted to the Engineer. The certificate shall be accompanied by an invoice of all items as scheduled in the Schedule of Quantities and reflect the progress made on each item.

Preliminary and general items

Unit..... Sum

Where provision is made in the Schedule of Quantities for Preliminary and General items, the sum(s) tendered shall cover the cost of all responsibilities specified in the Specifications together with all responsibilities in terms of the GCC. In interim certificates, payment for Preliminary and General Items will be made as a percentage of the tendered lump sum(s) pro rata to the value of work certified for payment.

Where no provision is made in the Schedule of Quantities for Preliminary and General Items the rates tendered for the scheduled items shall cover the cost of all responsibilities specified in the Specification together with all responsibilities in terms of the GCC.

Supply

Unit..... No or Sum

The tendered rate or sum shall cover the cost of supply of the goods, testing as required by Act No. 85, provision of test certificates certifying compliance of the goods with SABS, IEC, ISO or BS standards, corrosion protection and supply of all special tools and keys (if required).

Payment for supply of the relevant equipment will not be effected until the draft copies of relevant drawings and operations and maintenance manuals have been submitted.

Delivery

Unit..... No or Sum

The tendered rate or sum shall cover the cost of delivery of the goods and offloading at the delivery point stated in the Project Specification.

Where a rate or sum has been tendered for delivery of goods which are then stored as provided for in the specification, the Engineer may certify an amount for partial or full payment of the relevant item, if in the Engineer's opinion such a payment is justified by reason of the transportation of such goods to their place of storage.

Installation

Unit..... No or Sum

The tendered rate or sum shall cover the cost of all necessary site oriented activities such as handling, storing, sorting, erecting, all painting, testing and commissioning (unless scheduled separately), including all costs of transport of personnel and their erection gear to Site.

Testing

Unit.....No or Sum

The tendered rate or sum shall cover the cost of testing as specified including all costs of transport to and from Site, and Site accommodation of testing personnel and their equipment.

Commissioning (where scheduled separately)

UnitNo or Sum

The tendered rate or sum shall cover the cost of commissioning as specified including all costs of transport to and from the Site, and Site accommodation of personnel and their equipment.

Servicing visits

UnitSum or No of Visits

The tendered rate or sum shall exclude the cost of providing lubricants but shall cover the cost of servicing visits and operations as specified. Payment of 95% of the tendered amount will become due after each visit. The remaining 5% will be regarded as Retention Money and paid at the end of the Defects Liability Period.

Tools and spares

Unit..... Prime Cost Sum

The cost of special tools and keys shall be covered by the tendered rate or price for the supply of the. Payment for standard spanners and tool cabinet(s) will be made out of the Prime Cost Sum allowed in the Schedule of Quantities for such items. The Contractor's profit, administration and delivery charges will be paid at the tendered percentage of the actual purchase price of the goods.

Payment for spares will be made at the price tendered in the Spares Schedule which price shall cover the cost of supply, crating and labelling where applicable, and delivery to the Site of the said items.

Interim storage

Unit:.....Month

When interim storage is to be paid, the minimum period measured will be three months. The tendered rate shall cover the cost of providing storage in the approved store, protecting and maintaining the

goods in storage, handling the goods in and out of the store, and labelling and packing. No separate payment for storage will be made where normal delivery is effected.

Insurance for goods stored

Unit..... Month

When insurance for goods stored is to be paid, the minimum period measured will be three months. The tendered rate shall cover the cost of insuring the goods while in storage.

Additional visits to Site

Additional visits to Site ordered by the Engineer (other than visits required as a result of malfunctioning of, or defects in the Contractor's materials or workmanship, or as a result of circumstances for which the Contractor is responsible in terms of the Contract) will be scheduled as:

a) Transport Unit..... No of Visits

The tendered rate for transport shall cover the total cost of transporting personnel and equipment to and from Site.

b) Site operations Unit.....Day

The tendered rate for site operations shall cover the full daily cost of the wages, equipment, accommodation and local transport.

APPENDIX A: APPLICABLE STANDARDS

SANS 10083 The measurement and assessment of noise exposure during work for hearing conservation purposes

SANS 10142-1 The wiring of premises Part 1: Low voltage installations

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1. SCOPE

This specification covers the requirements for corrosion protection and painting of metal surfaces in pump stations, water treatment works and metal works in general.

SUPPORTING SPECIFICATIONS

SABS 1200 HC : Corrosion protection of Structural Steelwork

Where this specification is required for a project, the above supporting specification shall also form a part of the Contract document.

2. INTERPRETATIONS

Grit blast cleaning :	The directing of particles of abrasive steel shot or other grit against the surface to be coated. The grade of cleanliness shall be according to the Swedish Standard SIS 05 59 00.
Holiday:	A defect in the coating where the coating has been damaged or is too thin
Holiday detector:	An electrical device which electrically charges the item to be coated and senses and signals defects in the coating by means of an audible signal when passed over the coating.
Organic coatings:	<ul style="list-style-type: none">i. Coal tar and asphaltic bitumen coatingsii. Paint inclusive of epoxies, polyurethane, nylon and fusion bonded epoxy.iii. Thermoplastic coatings such as polyethylene, nylon and fusion bonded epoxy.iv. Tape wrap coatingsv. Film type coatingsvi. Miscellaneous coatings such as foams, etc.
FBE:	Fusion bonded epoxy
GRC:	Glass reinforced cement
HDPE:	High density polyethylene
MS:	Mild Steel
PVC:	Polyvinyl chloride
Sa:	Followed by a number refers to the Swedish Standard SIS 05 59 00
UV:	Ultra-violet radiation

3. DESIGN, MATERIALS AND MANUFACTURE

BLAST CLEANING

Grit for blast cleaning shall be in accordance with SABS 064 and/or BS 2451. Air used for blast cleaning will be free of oil and water.

PAINTS

GENERAL

Paints used for a coating system shall be mutually compatible. All paints supplied shall be in accordance with the SANS specification for their respective types and shall be of the best quality available.

ORGANIC COATINGS

The following basic requirements shall apply:

Durability :	Supplied coatings to be chemically inert. This means it shall have constituents that are free from further oxidation, polymerization or saponification and maintain its properties for an indefinite period of time. All coatings to be resistant to biological degradation.
Moisture permeability:	The coating is to be impermeable to the ingress of water and aggressive ions.
Mechanical damage:	The coating should resist mechanical damage when an impact of at least 4 Joules at 20°C is applied as per ASTM G 14.
Conformability:	All coatings to conform with the metal surface profile without causing voids, gaps, laminations and pinholes.
Application:	The coating should be able to be applied easily under normal site conditions as known or as described in the Project Specification.
Repairs:	Damage to coatings shall be easily repaired on site and conform to the specification after repair has been effected.
Adhesion:	Coatings to have a high resistance to peeling. Adhesion shall not be less than 6N per square millimeter of steel. Suitable priming and surface preparation shall in all cases be carried out to improve adhesion.

Flexibility:	The coating shall be flexible allowing elongation of 3% strain at 20°C and 1% strain at -18°C
Solvent free:	Where practical, solvent free paints shall be applied.
Non-toxic and tastefree:	All internal linings/coatings for potable water shall be non-toxic, non-tasting and non-tainting.
Degreasing agent :	Only water soluble degreasing agents to be used.
Primers:	The most suitable primer for the surface to be coated shall be selected in accordance with the manufacturers recommendation.

4. PLANT

Handling

Plant and equipment used during the painting operation shall be such that no pipe, valve or pump casing are overstressed during any operations.

Surface preparation

The Contractor is to provide all equipment necessary for grit blasting and preparation of surfaces prior to painting.

Painting

The Contractor is to provide all necessary equipment for airless spray-painting, the application of epoxy coatings, sintered epoxy powder paints or other methods as specified. All paints to be applied in the contractors workshop are to be applied by airless spray equipment, as FBE or approved. All site paintwork shall be to the Engineer's approval. The Contractor shall provide all required equipment and facilities required for inspection and testing purposes.

Colour

The final paint coat shall be of the colour as specified in the colour schedule attached to this specification.

Finishing and Painting

Finishing, painting and cleaning up the site are regarded as a part of the installation. After installation, all paintwork will be washed down with brushes and a suitable detergent to remove all grime and grease.

Corrosion Protection System

Copon System or similar approved

All corrosion protection of metalwork and piping for this contract shall consist of:

- Degreasing and abrasive blast cleaning to Sa 3.
- Four (4) coats of a two component liquid solvent borne high build polyamide coating to a dry film thickness of not less than 65µm per coat and not more than 85µm per coat.
- Total dry film thickness shall not exceed 250µm.
- EID testing by wet sponge with the testing equipment set at 90V 10MΩ

Hot dipped galvanizing

Hot dipped galvanizing shall be carried out in accordance with SABS 763. The coating thickness shall comply with the values specified for General Applications or Heavy Duty Applications as specified in the Project Specifications or drawings.

Galvanized surfaces which are to be painted shall not be passivated by the galvanizer.

Repairs to damaged galvanizing shall be carried out in accordance with the procedures specified in SABS 763 by hot metallic zinc spraying unless the use of an appropriate solder has been approved.

Nuts, Bolts, Washers, etc

All carbon steel bolts, nuts, washers and other fasteners are to be galvanized according to SABS 763. All nuts to be tapped after galvanizing. Washers are to be fitted to both bolt head and nut. After installation, nuts, bolts and washers are to be treated with a self etching primer and then painted together with the relevant items on which they are installed.

5. TOLERANCES

Film thickness tolerances

Individual coats:

A minimum of 90% of thicknesses measured shall comply with the system specification thickness.

Total DFT

No more than 10% of readings shall be less than the specified minimum thickness and no readings less than 90% of the specified minimum will be allowed.

6. TESTING AND INSPECTION

The Contractor remains fully responsible for the quality of the work done irrespective of any quality control testing done.

All datasheets, specifications and codes of practice for the materials used are to be made available by the Contractor.

Quality Control:

The Contractor shall carry out quality control testing and record the results of such testing to ensure compliance with the specification.

These records shall be made available for inspection of the Engineer. Incomplete or inaccurate records shall be regarded as non-compliance with this specification.

Independent Quality Control:

The Engineer will be free to employ an independent inspector to monitor the quality of the Contractors work on his behalf. In the event of a dispute, the Engineer's ruling will be final.

Sampling:

The Engineer may at any time remove a reasonable number of samples of materials to be used in the coating application. In the case that analysis of a sample leads to rejection, all work using the same batch will be placed on hold. Rejection of a batch of work may lead to the reworking of all components coated with said batch.

Destructive Testing:

The Engineer may carry out destructive testing to ensure compliance. Damaged areas are to be repaired by the contractor at no extra cost to the satisfaction of the Engineer.

TEST METHODS TO BE EMPLOYED

- **Determination of cleanliness:** SABS 767 and ISO 8501-1
- **Determination of surface profile:** SABS 772

- **Free of dust and debris:** SABS 769
- **Dry Film Thickness:** SABS 141
- **Soluble salts test:** Weber Reilly reagent

7. MEASUREMENT AND PAYMENT

Corrosion protection and painting

Payment for corrosion protection and painting will be included in the rate for the items to be protected or painted.

The tendered amount shall include the cost of surface preparation, supply and application of corrosion protection systems/paint and the costs associated with the quality control. No separate payment will be made for site repairs to paintwork.

APPENDIX A: RECOMMENDED COLOUR SCHEME

ELECTRICAL ITEMS

Delay and tap change panels	grey (SABS G29)
Eskom equipment	grey
Essential supply sections of boards	orange (BS 557)
H.V. Switchgear and boards	grey (SABS G29)
L.V. switchgear	light stone (SABS C37)
Name tags	white lettering on black
Outdoor kiosks	avocado green
Transformers	dark admiralty grey (BS 632)

HAND RAILS	lemon yellow (or stainless steel) (SABS C54)
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MECHANICAL EQUIPMENT

Couplings and other moving parts	international orange (SABS A15)
Grease nipples	fire orange (SABS A46)
Guards	chevron black and fire orange (SABS A46)
Pumps and motors	arctic blue (BS 112)
Pump and motor bases	dark admiralty grey (BS 632)

OVERHEAD GANTRY CRANES

Crane hooks	chevron black and fire orange (SABS A46)
Crawl beams	international orange (SABS A15)
Gantry cranes	international orange (SABS A15)
Rails	black

PIPEWORK

Air mains	white
Backwash recycle	cloud grey (SABS F48)
Backwash	wedgwood (SABS F59)
Chemical mix water	cornflower (SABS F29)
Chlorine	yellow (SABS C61)
Dewatering	green (SABS D2)
Lime	light green (SABS C37)
Polyelectrolyte	pastel green (SABS D65)
Potable water	blue (BS 166) (SABS F11)
Raw water	green (SABS D2)
Scour valves	deep buff (SABS B24)
Service water	dark blue (SABS F11)
Small bore tubing not listed above	lemon yellow (SABS C54)
Valves	as for the pipeline
Valve handwheels :	
Delivery	black
Suction	orange (BS 557)

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1. SCOPE

This Specification covers the requirements for the supply, detailing, fabrication, delivery, erection, testing and maintenance of all steelwork and aluminium in the Contract.

2. DESIGN, MATERIALS AND MANUFACTURE**Materials****General**

Unless otherwise shown on the drawings or scheduled, all steelwork shall be fabricated from mild steel sections, and all jointing and fixing bolts shall be supplied by the Contractor.

Mild steel

All structural steelwork shall comply with the requirements of BS 4360. The grade of steel used for trusses, bridges and ancillary structures shall be 43A.

Aluminium

All aluminium sheeting shall be Grade M57S material anodized for coastal areas. Structural sections, bolts and nuts, shall be Grade D65S.

Stainless steel

All stainless steel items shall be Grade 316 material.

Bolts and nuts

Bolts and nuts in their respective sizes shall comply with BS 4190. Bolts shall be of Grade 4.6 and nuts of Grade 4 with threads of the 'coarse pitch series'.

All nuts and bolts shall be Hot-dip galvanized. Washers shall be provided at each nut and generally shall comply with BS 4320 of "normal" diameter, and shall be coated to match the bolt and nut. Single coil square section spring washers - Metric series (Type A) complying with ES 4464 shall be fitted to all nuts subject to vibration.

High strength friction grip bolts, if used, shall comply with the requirements of BS 3139, and their use and design shall be as specified in ES 3294 (Part 1) and BS 4604.

Manufacture

General

The steelwork shall be constructed, fabricated and erected in accordance with SABS Standard Building Regulations and in accordance with details shown on the drawings.

The Contractor shall prepare his own shop details and other necessary drawings which shall be submitted in duplicate to the Engineer for approval. The Contractor shall include with his shop detail drawings full details as to which welding procedures he proposes to use.

Details are to be submitted at least one month before approval is required and no work is to be carried out until approval is obtained.

The Contractor shall be responsible for all dimensions and details in his working drawings and for the perfect fitting of all material supplied, and he shall replace at his own cost any material which does not fit properly into position.

The checking of detail and working drawings by the Engineer shall not absolve the Contractor in any way from inaccuracies of fitting.

Handrails, ladders, prefabricated flooring, etc

Handrails

Handrails shall be manufactured from steel tubing not less than 34 mm outside diameter for the two rails, and from tube 2.65 mm thick and not less than 42 mm outside diameter for the preformed one piece stanchions. The bases of the stanchions shall be preformed for platform or side and for horizontal or sloped mounting on concrete or steel. The stanchion spheres shall be preformed to suit right angled or other angled intersections all as indicated on the general arrangement drawings. Stanchions shall be spaced at intervals not exceeding 2,0 m and all handrails shall be supplied complete with fixing bolts, nuts, etc.

Where 'heavy duty' stanchions are scheduled, they shall be manufactured from tube 3.24 mm thick and be not less than 48 mm in outside diameter.

General Metalwork

All tubing and stanchions shall be galvanized before erection and all joints shall be welded after erection of handrails. Welded joints shall be repaired with "Metalgalv" or equal as specified. The Contractor shall set and grout in fixing bolts.

Ladders

Ladders shall be manufactured in accordance with the details and general arrangements shown on the drawings in lengths suitable for hot-dip galvanizing. All ladders and their fixings shall be galvanized.

All ladders shall be supplied complete with all necessary bolts, nuts and washers for fixing.

Prefabricated open and chequer plate covers

Open grid steel covers and floor panels shall be pressure locked and welded as 'Maclock' type "Eggcrate" or similar approved, and together with frames shall be hot-dip galvanized to SABS 763 after manufacture.

All span bars shall have a depth of 40 mm and be of such a width and at such spacing that the maximum deflection of any bar under a 10 kN/m² uniformly distributed load shall not exceed 1:360 of the clear span.

Under no circumstances will cutting and welding be permitted on Site.

Framing to open grid "Maclock" or "Eggcrate" covers or panels shall be assembled and welded to the detail as shown on the drawings.

Chequer-plate flooring shall be of 6 mm minimum thickness Aluminium "Treadplate" flooring or similar approved with raised 5-bar pattern and lifting key holes at each end of each plate.

Frames shall be of aluminium angle and bar welded together and as detailed on the drawings.

Welding

All welding of steelwork shall be carried out in accordance with BS 5135. The Contractor shall submit with his shop drawings full details of welding procedures. Unless otherwise approved, no longitudinal or overhead welding shall be carried out on Site. Site welding must be the minimum possible. Welders undertaking manual welding of permanent steelwork shall be experienced competent artisans.

Painting/Protection coating

General and surface preparation

The provisions of SPEC BVMECH01/4 shall apply.

All galvanized items which are intermittently or permanently in contact with sewage shall be feather blasted after galvanizing, The surface shall be moisture-free and free of soluble salts and airborne contaminants, and shall be painted with a twin pack polyamide-cured high build epoxy coating, as specified.

Cast iron items

All cast iron items to be installed underground or not exposed to view shall be twice hot bitumen dipped, using different shading bitumen, inside and outside.

Cast iron items to be cast into Concrete shall be degreased using "Oakite 31" and nylon brushes.

Cast iron items which are intermittently or permanently in contact with sewage shall be blast cleaned and painted with a twin pack polyamide-cured high build epoxy coating as specified.

Cast iron items which are exposed, but not in contact with sewage, shall be wire bush cleaned and degreased. The surface shall be painted with one coat of aluminium barrier coating and finished with universal enamel to give a dry coat thickness of at least 110 micrometres.

Testing and inspection of corrosion protection

To be in accordance with SPEC BVMECH01/4.

3. PLANT

General

The Contractor shall provide all plant that is necessary to install, test and commission all items of equipment covered by this Specification.

4. INSTALLATION AND OPERATING REQUIREMENTS

The general requirements of SPEC BVMECH01, where relevant, shall apply.

5. TOLERANCES

Unless otherwise specified, the terms of SPEC BVMECH01/6 shall apply, where relevant.

6. TESTING/COMMISSIONING

Mild steel

The steel shall be tested in accordance with the relevant clauses of BS 4360 Part 1, at the Contractor's expense.

7. MEASUREMENT AND PAYMENT

General

The prices tendered for the steel items will be held to include for the cost of protective coatings as specified, unless a separate item is scheduled.

Steelwork general

Unless otherwise scheduled, steelwork will be measured by mass of the steelwork as erected, excluding wastage and fastenings.

The rate shall cover the cost of the supply, testing, fabrication, delivery and erection of the steelwork, together with all operations specified and also for the supply and fixing of all anchor/holding down bolts, bolts, nuts, washers and plates.

Where erection of steelwork on Site is measured separately as a lump sum, the sum shall cover the cost of taking delivery on Site, erection, making good and site paintwork and fixing anchor/holding down bolts, etc.

General Metalwork

Handrailing

Handrailing will be measured by the length of the complete balustrade including top rail, middle rail and stanchions. The rate shall cover the cost of all materials and fastenings supplied, for welding, erection and protective coatings.

Ladders

Ladders will be measured by number of specified length. The rate shall cover the cost of all materials and fastening supplied, for welding, erection and protective coatings.

Prefabricated open and chequer plate covers and flooring

The open grid or chequer-plate flooring covers or panels will be measured by area. The rates shall cover the cost of all cutting and welding, etc., at the factory - prior to galvanizing if applicable - and the cost of any protective coatings.

The framing will be measured by length of the edge. The rate shall cover the cost of the supply and fixing complete including all cement mortar and bolts which may be required to secure the frame.

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1. SCOPE

This specification covers the supply and installation of pipework up to DN 1000 mm, for transporting water and sewage under working pressures of up to 2,5 MPa inside pump stations, treatment works and the like.

Definitions

The following definitions shall apply:

Bell hole	An enlarged excavation around a joint on the pipe to give room for workmen to reach the sides and bottom of the pipe.
Bending shoes	Devices used when bending a pipe to prevent crushing and flattening the pipe and to obtain a smooth curve.
Dolly	A device having rollers on which lengths of pipe can be placed, permitting the pipe to be rotated easily to facilitate welding.
Fitting.	<ul style="list-style-type: none">a) A special or valve.b) Any process of jointing (except welding) straight pipes to one another and to specials and valves.
Flexible pipe	A pipe of which the diameter is reduced by more than 1% under an external radial force before the appearance of cracks.
Manual shielded electric arc process welding. (MSEAP)	Electric arc welding done by hand using a filler electrode coated with a material which gasifies at the point of arc and excludes oxygen from the weld, thus improving the metallurgical quality of the completed weld.
Mitre welds	Welds which join two lengths of pipe at an angle point in such a manner that the axis of both lengths of pipe proceed in a straight line to the point of intersection.
Pig, Swab, Scraper	<p>These terms are loosely used interchangeably. Swab, however, is more commonly confined to mean a device passed through the pipeline during construction solely to remove obstacles and foreign matter which are hazards peculiar to construction.</p> <p>Pig and scraper mean devices for cleaning the pipeline after operations are in progress, for the removal of</p>

materials which may accumulate on the inside of the pipe walls during service.

Pinhole	A very small hole indicating a flaw in a weld or coating.
Pipe end bevel	A bevel cut made on the end of a pipe to afford a groove between abutting joints in order to receive weld metal.
Position weld	A weld made under such conditions that the pipe cannot be rotated to keep the welder always working in the same position, as a consequence of which the welder must change positions as his work proceeds around the weld (Stove pipe weld).
Rolling weld	A weld made from one position as the pipe is rotated.
Root or stringer bead.	The first weld bead applied to the joint between two sections of pipe.
Special	Any pipe other than a straight pipe. NOTE: Under this definition shall be included all sizes of specials of shapes such as bends, tees, crosses, angle branches, reducers, tapers and flexible couplings with or without centre registers.
Stove pipe welds	A weld made without rotating the pipe, requiring the welder to shift his working position to all quadrants.
Straight pipe	A straight pipe of uniform bore and of standard or non-standard length.
Pipework	Shall include all pipes, joints, specials, fittings and valves.
Welding icicles	Congested droplets of metal which extend through the weld to the interior of the pipe, caused by excessive heat or improper welding technique.

Additional abbreviations

CI:	Cast iron
CID :	Constant internal diameter
COD :	Constant outside diameter
FC :	Fibre cement
IRHD :	International rubber hardness degrees
DN :	Nominal diameter, which shall mean minimum inside diameter of the pipe as scheduled for all pipes over DN 150.
PN:	Nominal working pressure

OD :	Outside diameter, which shall mean DN + 2 x lining thickness + pipe wall thickness
p.e :	Plain-ended
PTFE :	Polytetrafluoro ethylene
PVC :	Polyvinyl chloride
PVC-U :	Polyvinyl chloride - unplasticized
Sa :	Followed by a number refers to the relevant part of Swedish Standards SIS 05 59 00.
SS :	Stainles steel

2. DESIGN, MATERIALS AND MANUFACTURE

General

Pipes and fittings shall be of the types shown on drawings or scheduled and, unless otherwise required in terms of the Project Specification. All pipes and fittings shall be supplied complete with couplings and jointing material.

Pipeline materials shall be so transported, stored and handled that pipes are not overstressed at any time and fittings are not damaged in any way. All thin-walled, flexible, and soft-coated pipes shall be handled with particular care and shall be so stored that they are not subject to concentrated pressure from stones or other obstructions. Pipes damaged or cracked in any way shall be removed from the Site at no cost to the Employer.

All pipework shall be supported and anchored by civil structures only where it passes through the walls of the building. All other supports and anchors shall be by means of steelwork designed, supplied and erected by the Contractor.

The orientation of pump suction and delivery pipework shall be such as to facilitate maintenance, and designed for minimum head losses, no air traps and to ensure that no stress is placed on the pump flanges.

Under no circumstances shall the suction or discharge manifolds be of a smaller diameter than those shown on the drawings. The flow velocity shall not exceed 1.5 m/s and 2.5 m/s respectively.

Steel pipes, fittings and specials

Unless otherwise scheduled or shown on the drawings, pipes etc., shall be manufactured from grade A steel plate complying with SANS 719.

Welding shall be in accordance with API Std. 1104. (See 5.2.2) or SANS 10044 Part 5 as applicable.

Pipes of nominal diameter up to DN 150

Unless otherwise scheduled or shown on the drawings, steel pipes and fittings up to DN 150 shall be of medium class and screwed, and shall comply with the applicable requirements of SANS 62.

Pipes of DN over 150

Unless otherwise specified, straight piping and specials shall be manufactured to the following dimensions:

Nominal Diameter	Minimum Plate Thickness		Minimum outside diam. Of Steel pipes and specials	
	Pipes (mm)	Specials (mm)	Epoxy Paint lined (mm)	Concrete Lined (mm)
200	4.0	5.0	219.1	219.1
250	4.0	5.0	273.0	273.0
300	4.0	5.0	323.9	323.9
350	4.5	6.0	355.6	375.0
400	4.5	6.0	406.4	430.0
450	4.5	6.0	457.2	480.0
500	5.0	8.0	508.0	530.0
600	6.0	8.0	609.6	640.0
700	6.0	8.0	711.2	740.0
800	8.0	10.0	812.8	845.0
900	8.0	10.0	914.4	945.0
1000	10.0	12.0	1016.0	1050.0
1200	10.0	12.0	1220.0	1255.0
1400	12.0	12.0	1420.0	1460.0
1600	14.0	14.0	1620.0	1665.0

Helically welded pipes will not be permitted inside pump stations or treatment works.

The pipe OD, length and type of joint shall be as specified in the Project Specification and/or as shown on the drawings.

Specials

Specials DN 150 and smaller shall comply with BS 1387.

Specials larger DN 150 shall be manufactured from pipes complying with the sizes stated in the table above. Specials shall be fabricated in accordance with BS 534.

All specials (except flanges) shall be suitable for a working pressure of not less than 2,5 MPa.

CI pipes, fittings and specials

CI pipes and flanged fittings shall comply with the applicable requirements of BS 2035.

Pvc-u pipes

PVC-U pipes and fittings shall be fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of SANS 966-1.

Jointing

Flexible couplings

Except where otherwise specified or scheduled, flexible couplings for plain-ended steel pipes shall be of the slip-on type. A coupling shall be

able to withstand a hydrostatic test pressure of twice the working pressure specified for the pipe for which the coupling is required, and coupling flanges shall be capable of withstanding all stresses caused by tightening of the bolts. Rubber rings shall comply with the relevant requirements of SANS 974: Part I and shall have a hardness of 66-75 IRHD.

Flexible couplings shall be supplied complete with all necessary bolts, nuts and rubber jointing rings.

Flanges

The drilling of steel and CI flanges shall conform to the requirements of SANS 1123 appropriate to the class of pipe specified.

Any item of pipework, special or valve that has flanges which are incorrectly drilled will be rejected. Reaming of bolt holes to oversize dimension in order to make a particular piece fit will not be permitted.

All flanges shall be machined overall with gramophone finish in accordance with SANS 1123.

Flanges for nominal pipe diameters greater than DN 1000 shall have raised faces.

Where the working pressure exceeds 1,6 MPa, and for all diameters of DN 400 and over, flange faces shall be machined in accordance with DIN 2514 specification. Valve faces shall be machined female to receive the rubber 'O' ring.

Loose flanges

Loose flanges for welding onto steel pipes on Site shall be manufactured from the same steel as is specified for the pipes, and shall be in accordance with SANS 1123. Any item of pipework that is found to have flanges that are incorrectly drilled will be rejected.

All loose flanges shall be suitable for field welding to pipes and specials, and shall conform to API 1104 in respect of attachment.

Gasketing

Each flanged pipe and fitting shall be supplied complete with one insertion piece, of the appropriate diameter, and made of a material that is suitable for the maximum working pressure, such as rubber for small diameter low pressure pipelines or compressed asbestos or other approved material for medium to large diameter and medium to high (2,5 MPa and higher) pressure pipelines, and one set of bolts and nuts.

Unless otherwise specified in the Project Specification, asbestos gaskets, in accordance with BS 2815 Grade B and having a minimum thickness of 2 mm, shall be supplied for working pressures not exceeding 1,6 MPa. Where working pressures exceed 1,6 MPa, rubber "O" rings dimensioned in

accordance with DIN 2514 Specification shall be supplied to suit suitably machined flanges.

Bolts and nuts

Bolts and nuts shall comply with the relevant requirements of SANS 1700, or where high strength friction grips are specified in the Project Specification the bolts shall comply with the requirements of BS 3139, and their use and design shall be as specified in BS 3294, Part 1 and BS 4604. Locking devices for nuts shall be provided wherever there is a possibility of the nuts becoming loose during service.

All bolts, nuts and washers shall be hot dip galvanized.

Screw-ended pipes

Screw-ended pipes shall comply with the relevant requirements of SANS 1109. Male ends shall be taper-screwed and female ends shall have parallel threads.

Spigot specials

Each spigotted special shall be supplied with one sleeve coupling (or such other type of coupling as is shown in the drawings) to suit the particular pipe with which the special is to mate. The coupling shall fit the larger end of the barrel in the case of a reducer.

Spigot and socket pipes

Spigot and socket pipes shall be provided with rubber or neoprene sealing rings for forming flexible couplings.

Welding electrodes

The Contractor shall supply all the necessary welding electrodes, which shall be of the shielded type.

Valves

All valves shall be hydraulically tested. Unless otherwise scheduled or shown on the drawings, valves shall comply with the following requirements.

Gate valves

Gate valves shall comply with the following as applicable:

- a) for working pressures up to 1,6 MPa and over DN 50 but not exceeding 600 mm shall be of cast iron and shall comply with the relevant requirements of SANS 664;
- b) for working pressures over 1,0 MPa and of diameter exceeding DN 600 shall be of cast steel and shall comply with the material and construction requirements of SANS 191 and with dimensional requirements of the approved manufacturer.
- c) the outlet connections shall be flanged or spigot plain ended as scheduled;

d) the spindles shall be non-rising and made from either zinc-free bronze, 304 stainless steel or as approved;

e) the spindles shall be fitted with hand wheels;

f) the direction of closing shall be clockwise;

g) the valve design shall be such that it may be opened or closed against the differential pressure specified in the Project Specification or schedule, with an effort applied by one man of 200 N exerted simultaneously with each hand on the rim of a standard handwheel, or on the cross bar of a tee key with hands spaced 900 mm apart (total effort 400 N).

In order to achieve this, gate valves shall be fitted as required with either plain or ball thrust bearing, spur gearing and close-machined channel guides and shoes;

h) for working pressures above 1,0 MPa and valves of DN 250 and under, and all valves of DN 300 and over, valves shall be fitted with a spur reduction gear having an advantage of not less than 2:1;

i) for working pressures above 1,0 MPa valves shall be fitted with ball-bearing spindle thrust collars;

j) i) the seat rings shall be pinned, and manufactured from either phosphor bronze, 304 stainless steel or as approved;

ii) alternatively resilient seal valves (RSV) may be offered unless excluded in the Project Specification.

The gate of the RSV shall be completely covered by natural or an approved neoprene rubber to a minimum thickness of 1 mm and pinhole free;

k) i) the gland packing shall be lubricated and graphited cotton packing ;

ii) two rubber "O" seal rings of an approved design shall be provided;

l) the design of all valves shall be such that they may be mounted vertically;

m) flanged valves shall be drilled off-centre, and

n) electrically operated actuators, where specified in the Project Specification, shall comply with (e).

Butterfly valves

Butterfly valves for working pressures exceeding 2,5 MPa shall comply with the requirements of the Project Specification. Valves for working pressures up to 2,5 MPa shall comply with the relevant requirements of BS 5155 and the following:

a) The valve shall:

- i) be manufactured from materials as specified in Table 3 of BS 5155;
- ii) be suitable for connecting to pipe flanges by individual bolting;
- iii) have a replaceable stainless steel or zinc-free, phosphor bronze seat mechanically fixed to the body and a resilient rubber or neoprene seal, replaceable and adjustable on site, mechanically fixed to the edge of the disc;
- iv) be suitable for flow in either direction, capable of use as a regulating valve and shall shut off drop tight, and have a maximum working pressure as stated in the Project Specification;
- v) be clockwise closing;
- vi) be designed for installation with the main shaft horizontal and the operating shafts vertical;
- vii) be designed such that it may be opened or closed against the differential pressure specified in the Project Specification or scheduled, with an effort not exceeding 250 N on the handwheel in the case of valves up to 300 mm in diameter, and not exceeding 400 N on the handwheel in the case of larger valves;

b) the seal retaining rings and screws shall be of an approved stainless steel or zinc-free, phosphor bronze;

c) the main shaft shall be offset from the centreline of the disc so as not to pass through the seal;

d) the body ends shall be flanged and drilled in accordance with the flange specification and off-centreline;

e) the valves shall be fitted with actuators which shall:

- i) not be an integral part of the main body but shall be a separate unit bolted to the main body in such a manner that water leaking past the main shaft seal is prevented from entering the actuator;
- ii) be fitted with a horizontally mounted handwheel at a height that provides for reasonable operation under the conditions shown on the drawings;

iii) comply with Section 11 of AWWA C 504, and shall be capable of opening and closing torques at least 30% in excess of the necessary under the working conditions stated in the Project Specification, and

f) the valve assembly shall be protected against corrosion.

Each valve shall be supplied with a certificate certifying that it complies with the requirements of this specification and that it has been tested and inspected in terms of BS 5155.

Check valves

Check valves shall be so designed that they perform in the manner, and fulfil the requirements set out in the Project Specification. The valve shall be suitable for horizontal or vertical mounting, of robust construction, and shall close drop tight at the required operating head. Access to the moving parts shall be possible without removing the valve from the line. In addition, the following shall apply:

a) For flanged check valves:

- i) the valve shall be double flanged;
- ii) the body, cover and door shall be of close-grained cast iron;
- iii) the door shall be fitted with a zinc-free phosphor-bronze face closing on a corresponding bronze face in the body, and
- iv) the door suspension lugs shall be hinged on a long zinc-free, phosphor- bronze spindle supported in trunnion bearings on both sides of the body;

b) For wafer type spring check valves:

- i) the discs shall be either stainless steel or carbon steel with resilient seats, and
- ii) the valve bodies shall be manufactured of the materials specified.

Air valves for water

Air valves for water shall be Vent-O-Mat type RBX or equal approved.

a) The body for all types of air valves shall be:

- i) for working pressures up to 2,5 MPa, cast iron or stainless-steel cylindrical body with ends that conform with the relevant clauses of BS 1452 for Grade 220, and
- ii) for working pressures exceeding 2,5 MPa, cast steel.

- b) Each air valve shall be supplied with:
 - i) a bronze isolation cock, (for DN 25 valves only), and
 - ii) flanged isolating RSV gate valve , and with or without bevel gears and spindle cap or handwheel as specified, or for operation in the manner specified in the Project Specification.
- c) Each double or multiple orifice air valve (flanged) shall be fitted with a suitable drain cock to release the pressure inside the valve when the isolating valve is closed at a time when the float is sealing the large orifice.
- d) Unless otherwise specified in the Project Specification, single, small orifice air valves shall be capable of releasing automatically under normal operating pressure and conditions any air entrapped in the pipeline, and shall be of the lever type with a 316 stainless steel ball.
- e) Triple orifice air valves shall be provided with cast iron shield plates so designed as to prevent the entry of dirt when the large orifice is open.

Air Valves for sewer rising main

Air valves for sewers shall be Vent-O-Mat type RGX or equal approved.

- a) All materials used in the manufacture of the valve shall be so compatible as to reduce corrosion and electrolytic action to a minimum. The end covers shall be FBE painted.
- b) The valve shall be constructed of close-grained cast iron;
- c) The valve body shall be contoured to ensure that there are no corners or rough surfaces to which solids may adhere;
- d) Two wash-down sludge plugs for cleaning and inspection shall be provided.
- e) All mechanisms shall be totally enclosed;
- f) The seat profiles of the three orifices shall be such that the valves are gas-tight at pressure not exceeding 50 kPa.
- g) The valve seats shall be readily accessible for cleaning and inspection on removal of the cover bolts;
- h) The head casting shall be specially strengthened and dimensioned to receive a vertical vent pipe, if required subsequently;
- i) The operation of the valve shall be such that the sewage never comes into contact with the plastic cylindrical floats or valve seats.

Pressure gauges

Pressure gauges shall be fitted to the pipework as shown on the drawings or as specified in the Project Specification.

These gauges shall be as specified in the Project Specification.

Corrosion protection**Pipework, specials, valves and pumps**

Corrosion protection shall be in accordance with the requirements of the Project Specification and shall generally be protected as detailed in the clauses of SPEC BVMECH01/4

Protection against electrolytic corrosion

External protection against electrolytic corrosion, consisting of an extruded sheath of polyvinyl chloride or polyethylene, an impervious adhesive plastic tape or petroleum- based impregnated tape or other approved insulating material, shall be applied where required in terms of the Project Specification.

Flexible couplings

Flexible couplings for steel pipes shall be thoroughly cleaned and then treated as specified in the Project Specification.

Bolts, etc

Mild steel bolts, nuts and washers for joints shall be thoroughly cleaned and hot dip galvanized unless another means of corrosion protection is specified in the Project Specification.

Corrosive soil

Where scheduled or ordered, steel or cast iron fittings and joints that are to be subjected to corrosive soil conditions shall be wrapped with an approved plastic tape or protected with other scheduled or approved materials.

3. PLANT**Setting out**

The Contractor may use any acceptable device to control the alignment and installation of pipework and valves.

Temporary supports

The Contractor shall provide such temporary supports as are necessary, in the vicinity of the position of permanent supports, to ensure that pipework and valves are installed true to level and alignment.

Handling and rigging

The plant and rigging equipment used by the Contractor for the handling and placing of pipes and valves shall be such that no pipe shell or valve casing is over-stressed during any operation covered by the specification.

Testing

The Contractor shall provide the pump, pressure gauges, etc, as well as the necessary tools and fittings required for the performance of the tests required.

Welding equipment

The Contractor shall supply all welding equipment, generators, clamps, dollies, swabs and other equipment and labour required.

Welding machines shall be operated within the amperage and voltage recommended for each size and type of electrode, Any equipment which does not meet the requirements shall not be used until it has been repaired or alternatively replaced.

4. INSTALLATION AND OPERATING REQUIREMENTS**Installation and laying****Inside structures**

All pipework shall be installed and supported to even grades and to the levels and alignments shown on the drawings or as directed. Both the suction and discharge piping shall be supported over the pumps with rigid supports and/or anchors to prevent strain from the pipework acting directly on the pumps.

Outside structures**General**

Pipes outside structures shall be laid to even grades and with a cover of 800mm or such other cover as is directed or shown on the drawings. Where so required, slight misalignment may be taken up by deflection at pipe joints, but the deflection shall not be greater than the deflection recommended by the manufacturer of the pipe.

Where site welding of joints is approved bell holes shall be provided at each joint.

Pipe trenches shall be kept free of water from the time that laying commences until backfilling has been completed.

Should it be necessary to cold bend steel pipes on site, the Contractor shall employ bending shoes. The minimum radius allowed will be 20 times the pipe O.D.

Minimum clearance between pipes

The minimum clearance between the outside of a pipeline being laid and the outside of any other pipe that it crosses shall be 150 mm. Where this requirement conflicts with other requirements, the Contractor shall ask the Engineer for written instructions and shall carry out the work in accordance with those instructions.

Damage

Each pipe and each fitting shall be thoroughly cleaned and carefully examined for damage and defects immediately before laying. Should any damaged or defective pipe or fitting be laid, it shall be removed and replaced at the Contractor's expense and to the satisfaction of the Engineer.

Keeping pipelines clean

Every reasonable precaution shall be taken to prevent the entry of foreign matter and water into the pipe(s). At any time when work is suspended for a significant period, the last laid section of each pipe shall be plugged, capped, or otherwise tightly closed until laying is recommenced. All pipes shall be swabbed as work proceeds.

Jointing**Flanges** (steel pipelines)

In the jointing of steel pipes with flanges, special care shall be taken to align, grade, and level the pipes, specials, and valves to avoid straining of the flanges. All bitumen shall be removed from the face of each flange immediately prior to jointing (epoxy paint need not be removed). Insertion pieces shall comply with the applicable requirements and form a continuous ring(s) between the flanges. In the case of small diameter flanges, accurately cut holes shall be provided for the bolts. All threads shall be oiled with an approved lubricant during erection to ensure ease of removal during maintenance.

Bolts shall be tightened up evenly in opposite pairs to ensure uniform bearing on the insertion. Care shall be taken to avoid damage to the internal and external surfaces of the pipes during assembly of the pipeline.

Wherever loose flanges are welded onto pipelines, the Contractor shall ensure that internal and external coatings are restored so that they comply in all respects with the specification for such coating and are soundly bonded to the existing coatings. All pipes and specials, whether flanged or not, shall be supplied complete with all jointing materials, bolts and nuts necessary to make and complete all joints.

Welding (steel pipelines)

Unless otherwise approved, all welding done by hand shall be MSEAP welding, and done in accordance with API Std. 1104.

Pipes shall be manufactured by an approved automatic submerged-arc welding process or shall be electric resistance welded. Where automatic submerged-arc welding is employed, at least one pass shall be made on the inside and at least one pass on the outside.

The number of longitudinal weld seams shall not exceed one seam for pipes up to DN 1000. Field welding will not be permitted without the Engineer's prior approval, which will be granted only where the Contractor describes fully the method to be employed in making good the lining and coating at each weld.

The Contractor shall guarantee that the quality of the repairs to the protective coating and linings is equal to the original protective system.

Field welding of steel pipelines shall comply with the relevant requirements of API Std. 1104. Each welder shall have a unique number with which he shall mark each joint welded by him, so that it can be identified. Before welding, all foreign matter shall be removed from the pipe ends. If any of the pipe ends are damaged to the extent that satisfactory welding contact cannot be obtained, the damaged pipe ends shall be cut and bevelled with an approved bevelling machine to the Engineer's approval. Should laminations, split ends, or other defects in the pipe be discovered, the joint containing such defects shall be cropped, repaired or removed from the pipeline as ordered by the Engineer. All repairs shall be done at the Contractor's expense.

The space between abutting pipe-ends, when aligned for welding, shall be such as to ensure complete penetration without burn-through. For pipes having the same dimensions, the spacing shall be approximately 1.5 mm. The alignment of the abutting pipe-ends shall be such as to minimise the offset between pipe surfaces. Internal lineup clamps shall be used whenever practicable. External line-up clamps shall be used where it is impracticable to use internal line-up clamps.

At the discretion of the Engineer, roll welding will be permitted provided proper arrangements are made to maintain the alignment between adjacent pipes being welded.

Where spigot and socket joints are approved, field welding will be permitted. An approved epoxy mortar shall be applied to the inside of the socket in such a manner that the whole space between the spigot and socket is filled to prevent the ingress of water. The filler and finish weld beads shall be deposited by an acceptable method and each filler bead shall be approximately 3 mm in thickness. Completed welds shall have a reinforcing of 1,2 mm \pm 0,3 mm above the pipe surface around the entire perimeter of the weld, and the width of the finish bead shall not be more than 3 mm greater than the original groove. Each weld shall consist of at least three (3) beads. No two beads shall be started at the same point. In the case of spirally welded pipe the reinforcing may be increased to 2.5 mm \pm 0.5 mm.

No mitre welds will be permitted on site (only at the manufacturer's works), and all welds shall be at ninety degrees (90°) to the axis of the pipe. All slag and scale shall be removed from each bead for visual inspection immediately after each bead has been run.

Welding will not be permitted when in the opinion of the Engineer the quality of the completed weld may be impaired by the prevailing weather conditions, including, but not limited to, air-borne moisture, blowing sand, or high winds. Where practicable, the Contractor will be permitted to erect approved screens to protect the welding operations.

Where ordered by the Engineer or specified in the Project Specification, welds shall be examined by radiographic inspection as stated in API Std. 1104.

All field welds shall be tested by a qualified inspector using the dye-penetrant test method.

Detachable couplings (FC, PVC-U and steel pipelines)

Each end of all pipes shall be thoroughly cleaned by brushing and wiping immediately prior to being jointed. All rubber rings and seals shall be carefully inspected after being placed in position, and before the joint is closed, to ensure that they have not suffered any cuts, tears, or other damage, and are not in any other way defective. Only the lubricant recommended by the manufacturer shall be used for sleeve-type couplings and rubber seal rings of FC pipes.

Polyurethane joints for PVC-U pipes shall be lubricated with soft soap or similar material approved by the manufacturer. Grease derived from petroleum products shall not be used in PVC-U pipe joints. PVC-U and FC pipelines with CI detachable couplings shall have a gap, after laying and jointing, of approximately 10 mm between the ends of the pipes and central to the collar, to allow for expansion when the pipes are filled and have absorbed moisture.

Design of specials

The Contractor shall be responsible for the design of all specials. He shall submit his design calculations to the Engineer for approval before manufacture commences. The Contractor shall ensure that all the necessary collars, Triforms and/or other forms of reinforcing required to prevent distortion or local over-stressing are an integral part of each special. Lifting eyes (lugs) shall be welded to all specials of DN 450 and larger to facilitate handling and minimise damage to the pipe coating.

All fabricated specials shall as far as practicable be constructed such that bends are formed to a radius three times the OD of the pipe (either by mitres of a maximum of 22,5° or hot bent) and all reducers (or expanders) shall have a maximum angle of divergence of 10°.

All specials and fittings shall be manufactured exclusively at the works of an approved manufacturer, and at one works only. No Site fabrication of specials will be permitted.

Setting of valves, specials and fittings

Unless otherwise shown on drawings or directed, gate and control valves shall be set upright, and butterfly valves shall be set with the main shafts horizontal. All valves, specials, and fittings shall be correctly set, supported, and placed in position as the work proceeds, and shall be properly jointed to their respective pipes.

4. TOLERANCES

General

No deviation that is visible to the naked eye will be permitted.

Control points

For the purposes of this clause, valves set on the centre line of the pipework and designated changes in gradient or direction shall be regarded as control points, and shall be located with a permissible vertical deviation of ± 5 mm on the centre line. The same deviation will be permissible laterally. The maximum distance between control points shall be 100 m.

Alignment (plan and level)

Unless otherwise directed, the permissible deviation in alignment between control points from a straight line joining the control points, when measured on the top centre of the pipeline, shall be ± 5 mm.

The permissible deviation from the designated level at any point on the invert of the pipeline shall be ± 5 mm.

5. TESTING AND COMMISSIONING

General

The pipework valves and specials shall be tested by means of test equipment supplied by the Contractor.

In the case of steel pipelines butt-welded or fillet-welded in the field, joints shall be tested immediately after being made.

Each test shall be carried out in the presence of the Engineer or his representative. The Contractor shall be responsible for carrying out all tests and for all expenses incurred. When carrying out the hydraulic test, the Contractor shall ensure that all valves, tees, and bends are properly secured and shored to prevent movement of pipes and fittings and, should any such movement occur, the Contractor shall, at his own expense, reposition and, if necessary, repair the pipes and fittings and the securing means.

Until the pipework has been subjected to the pressure test, and has complied with the applicable requirement for the allowable leakage rate given, the pipework will not be accepted. The test shall be repeated until the Engineer is satisfied that the pipework under test complies with these requirements.

Initial tests on welded steel pipes

Dye-penetrant test

The inside and outside of every weld in steel pipes and specials shall be subjected to a dye-penetrant test carried out as specified below:

a) The Contractor shall obtain the approval of the Engineer for the group of the dye-penetrant and the developer he proposes to use for the test.

b) the clean and dry surface to be tested shall be thoroughly and uniformly coated with approved penetrant by immersion, flooding, brushing or spraying. The surface shall remain wetted for the period recommended by the penetrant manufacturer but in any case, this period shall not be less than 15 minutes, unless otherwise authorized by the Engineer. The excess penetrant shall be removed by wiping the surface with a suitable absorbent material dampened with penetrant remover or other approved methods.

After removal of excess penetrant, the test surface shall be dried by normal evaporation or forced air circulation as approved, at a temperature not exceeding 50°C and for a period not exceeding 10 minutes.

c) After drying of the test surface, the approved developer shall be uniformly applied in a thin coating by spraying or brushing. Thick coatings and pools of wet developer shall be avoided.

d) The test shall be applied to shop welding prior to despatch of pipes to the Site. Field welds shall be subjected to the test shortly after each weld is completed as pipe laying progresses.

e) In order to obtain a surface that is dry, clean, and free from scale, dirt, and grease, the Contractor may grind, but he shall not grit blast the surface.

f) The temperature of the surface to which the developer and the penetrant are applied shall not be below 16°C or above 52°C.

g) Observations for indications of penetrant on the opposite side of the metal to which the penetrant has been applied shall be made not less than 15 minutes and not more than 60 minutes after application of the penetrant.

h) Any surfaces on which non-relevant indications are observed shall be explored by visual methods and, if considered necessary by the Engineer, such surfaces shall be cleaned and retested.

i) Welds that show no relevant trace of dye on the developer will be accepted.

Radiographic examination

Joints shall be examined radiographically as and to the extent set out in the Project Specification when required.

Standard hydraulic pipe test

Test pressure and time of test

Unless otherwise ordered, hydraulic field testing shall be commenced only after permanent anchor blocks have attained their specified strength or after 28 days, whichever is the earlier.

The pipework shall be tested in sections between isolating valves and/or end caps, blank flanges, or other isolating devices, at the pressure given appropriate to the type and, when relevant, class of pipe in the pipeline under test.

The test pressure for field testing shall be 1,5 (or such other factor as is stated in the Project Specification) times the maximum working pressure laid down in the Project Specification.

The test pressure applied to the pipework under test shall be such that the pressure at any point is not greater than 1,5 times the maximum working pressure at these points.

The field test pressure shall not exceed the appropriate of the following values:

Type of pipe	Specification	Test pressure expressed as a percentage of the specified hydraulic test pressure
Mild steel	SANS 719	50% (3,5 MPa max.)
Cast iron	BS 2035	67% (or works test pressure)
Fibre-cement (COD) & (CID)	SANS 1223	75% of the test pressure for permeability test.
Black polyethylene	SANS 533	100%
uPVC	SANS 966	75%

Where circumstances permit, in the case of fibre cement pipes and cement mortar lined steel pipes, the pipework shall be filled at least 24 hours before the test pressure is applied, to ensure saturation of the pipework.

Care shall be taken to ensure that all air is expelled from the line to be tested after it has been filled and before the test commences.

All valves shall be successfully hydraulically tested in the manufacturer's works to at least twice their guaranteed working pressure.

Visible leaks

Except as allowed, the test pressure specified shall be maintained for a period of at least 3 hours (or such longer period as is necessary for inspection of the pipeline) by means of a suitable pump, during which period all pipes, specials, joints, and fittings shall be carefully inspected for leaks. All visible leaks shall be made good and any pipe, special, or fitting found to be defective shall be removed and replaced, at the expense of the Contractor, and such replacement material shall, after installation, be tested at the expense of the Contractor.

In the case of pipes of nominal diameter under 400 mm, the test period may be reduced proportionally to the nominal diameter of the pipe, provided that in no case shall the test period be less than 1 hour.

Permissible leakage rates

The test pressure shall be maintained for a further period of 1 hour after the completion of the procedure above, during which time the volume of water required to be pumped into the pipeline for maintenance of the pressure shall be measured. No additional water shall be required in the case of continuously welded steel pipes, and in other cases the volume shall not exceed the value, in litres, calculated from the applicable of the following formulae:

a) Jointed pipes in steel, cast iron, black polythene, and PVC-U:

0,01 x diameter of pipe in millimeters
 x length of test section in kilometres
 x square root of the test pressure in megapascals

b) Fibre cement pipes and concrete-lined steel pipes:

0,075 x diameter of pipe in millimetres
 x length of test section in kilometres
 x square root of the test pressure in megapascals

6. MEASUREMENT AND PAYMENT

Scheduled items

Supply and install complete suction and delivery pipework, valves, etc
Unit..... Sum

Pipework will be measured by sum or as scheduled.

The sum shall cover the cost of the provision of the pipes, specials, valves, fittings and pressure gauges, complete with couplings, and the costs of the handling, inspecting, transporting, jointing, cutting, installing, testing and anchoring.

No extra payment over and above the rates will be made in respect of any additional cutting, turning, and jointing of pipes required for the location of valves exactly in the positions given on the drawings.

Unless specific provision is made in the schedule, no separate payment will be made for the supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths.

Extra-over for excavation for bell-holes in rock

Unit..... m3

No additional payment will be made for bell-holes, except where hard rock is encountered in the trench, in which case an extra over payment on trench excavation will be made for rock.

Extra-over for encasing joints

Unit..... No.

Where wrapping or protection of joints, etc., is ordered, payment will be made as an extra-over per joint.

The rate shall cover the cost of the material, plant, and labour necessary for the completion of the joint.

Temporary valves, etc

UnitNo. or Sum

Payment for the supply or loan of temporary valves, end caps, blank flanges, or other isolating devices ordered by the Engineer will be made at daywork rates or at a price to be agreed by the Engineer, unless the method of payment for the work has been dealt with in the Project Specification and a suitable item included in the schedule.

Special wrapping in corrosive soil (diameter and location stated)

Unit.....m

The rate shall cover the cost of the provision and fixing of the wrapping and the cost of any delay and inconvenience caused by the requirement to wrap.

Cold bending of pipes

An extra over payment on the sum tendered for cold bending of steel pipes will be made only where such bends are ordered by the Engineer in addition to those shown on the drawings.

Payment will be made at daywork rates or at a price agreed by the Engineer.

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1. SCOPE

This specification covers the requirements for the supply, delivery, installation and testing of equipment for the solution feeding of chemicals for the treatment of water for household use.

2. DESIGN, MATERIALS AND MANUFACTURE**General**

All chemical feeding and storage equipment shall be provided complete with all piping, valves, brackets, fixings and all equipment necessary for the chemicals specified.

All materials used in the construction of the equipment shall in themselves be resistant to the chemicals to be used or shall be suitably protected from the action of these chemicals. Details of materials proposed shall be stated in the relevant Detail Sheet.

Electric motors forming part of the dosing apparatus shall be securely sealed against penetration by the chemicals in use. They should be readily accessible for repair and maintenance.

Equipment required

The equipment required is for the bulk storage and the solution dosing of the chemicals specified in the Project Specification.

The equipment shall comprise:

- (i) Chemical bulk storage tanks to the sizes and number stated in the Project Specification.
- (ii) Pipework to convey the chemical from the bulk storage tank to the chemical metering pumps.
- (iii) Chemical metering pumps to dose the chemicals specified at the rates specified in the Project Specification.

Solution feeding equipment and bulk storage tanks

- (iv) Delivery pipework and fittings to convey the chemical to the point of application, including dosing point connection.
- (v) In-line mixer and fittings to dilute the dosed chemical prior to application to the raw water.

Bulk storage tanks

Bulk storage tanks shall be manufactured from a non corrodible material suitable for the stored chemical.

They shall be provided with the following:

- (i) Access hatch of 480 mm minimum diameter in the top of the tank.
- (ii) Flanged hatch of 250 mm diameter in the top of the tank to allow for the fitting of a level metering device
- (iii) Level indication by means of sight glass or similar. The sight glass shall be graduated in m³ to the first decimal place.
- (iv) Drain outlet and ball valve.
- (v) Outlet and ball valve to allow for connection to the pump suction manifold.
- (vi) 100 mm Stortz coupling and pipework to allow for filling.
- (vii) Air vent in the top of the tank, fitted with suitable insect / vermin proof mesh.

Bulk storage tanks shall founded on concrete slabs or foundations.

Dosing pumps

The dosing pumps shall be piston operated diaphragm pumps capable of operating over the range specified in the Project Specification.

The pump shall be driven by a variable speed electric motor and a speed controller capable of accepting a 4 - 20 mA signal.

Pipework and fittings

General

Chemical pipes and hoses shall be of non-flame propagating materials suitable for the chemicals in use. They shall be arranged for easy dismantling for cleaning, and, if screwed joints or joints formed by solvent welding are proposed, enough flanged or flexible joints shall be provided to enable the pipework to be removed in sections without working from one end to the other of a particular run. Tees and cocks shall also be provided at convenient points for the connection of a pressure water supply to flush pipework through as required.

All necessary chemical delivery piping, fittings, support racks or trays and brackets to serve the plant supplied shall be provided.

Valves shall be of the ball or diaphragm type, with bodies or linings suitable for the chemicals to be handled.

Suction pipework. (Bulk tanks to daytanks / make-up tanks)

The pipework shall include either calibration pots or a 200ℓ tank and load cell for measuring the pump rate of delivery.

Delivery pipework

The delivery pipework shall include:

- (i) Pulsation dampers.
- (ii) Loading or back pressure valves.
- (iii) Dilution water connections and in-line mixers.
- (iv) Pressure relief valves as shown on the drawings.

Dosing connection

Mixing of the chemical solution into the raw water shall be by means of an in-line mixer in the raw water pipeline as shown on the drawings.

The in-line mixer and flanged connection in the raw water pipe will be provided by others.

The Contractor shall provide all piping and fittings, including the dosing probe to connect to the raw water line as shown on the drawings.

3. PLANT

General

The Contractor shall provide all plant that is necessary to install, test and commission all items of equipment covered by this specification.

4. INSTALLATION AND OPERATING REQUIREMENTS

Installation

Chemical pipes shall be fully supported without sags, and secured to racks or trays to be fixed to ducts, walls of tanks and buildings as necessary. The method of securing the pipes to the racks shall be by clips, or similar, facilitating easy removal in such a way that individual runs can be changed without dismantling adjacent pipes.

All chemical pipes shall be colour banded to identify the chemical carried.

5. TOLERANCES

The metering pump shall be capable of feeding in the range specified in the Project Specification and shall have a repeatable accuracy not worse than $\pm 3.0\%$.

6. TESTING/COMMISSIONING

Tests shall be conducted on the equipment, as specified hereunder.

Acceptance test

After installation of the equipment, and before commissioning, each metering pump shall be tested throughout its operating range and calibration curves shall be produced. The calibration curves shall be incorporated into the operating and maintenance instructions.

7. MEASUREMENT AND PAYMENT

Testing

Measurement and payment for testing will be by the sum for each portion of equipment as scheduled. The tendered sum shall cover the cost of all plant and personnel for conducting the test and in the case of the preliminary test shall include the cost of the chemicals. For the acceptance test the chemicals will be provided by the Employer.

SPEC BVELEC01/0 GENERAL TECHNICAL SPECIFICATIONS: ELECTRICAL

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SPEC BVELEC 00/1 : GENERAL TECHNICAL SPECIFICATION

1. GENERAL

This part of the specifications gives the general requirements for MV & LV electrical installation work. These requirements are based on the relevant quality specifications given and are augmented by the specific requirements for this Contract given in the project specifications.

The following documentation must be provided with tender off Electrical contractor/sub-contractor responsible for specific specialist installations:

1. Tenderer to submit written proof that he owns sufficient plant and equipment to complete the project timeously or alternatively list the plant he intends on renting,
2. Tender to submit written of his labor force he intends to utilize,
3. Company organogram,
4. Company profile,
5. CV's & certificates of key personnel members he intends to utilize ,
6. Reference letters or completion certificates of similar installations completed.

2. SUMMARY OF CONTRACT

The contract will provide for the supply of some or all of the materials required and the provision of labour and expertise for the installation of some or all of the materials in accordance with the requirements of the Project Specifications.

3. DRAWINGS

The electrical drawings form an integral part of the Project Specification. Tenderers are advised to visit the site and thoroughly acquaint themselves with the nature and extent of the work to be done.

4. SUPPLY OF MATERIALS

The onus is on the Contractor to order material well in advance to ensure timely delivery. No extension of time shall be allowed for late delivery of material due to orders not placed on time.

5. STANDARDS

In view of the fact that this installation is to be operated and maintained by others it is a condition of this Contract that the standard of workmanship and quality of materials will be subject to the approval of the Engineer and the party finally responsible for the operation and maintenance of the system. All correspondence in this regard shall however be directed to the Engineer and the final approval will only be granted by him.

6. DAMAGE TO OTHER SERVICES

The Contractor shall be held liable for all damage to other services and if such damage is not replaced to the satisfaction of the Engineer within a reasonable period the Engineer shall be entitled to appoint another Contractor to repair such damage and debit the account of the Electrical Contract. It is essential that the Contractor should liaise with the Engineer and other Contractors on site in order to minimize such damage.

7. OUTAGES

Power outages will be required to perform some of the tasks involved on this project. Outages are to be planned allowing sufficient notice to the Employer and in compliance with any reasonable stipulations required. Liaison with the Engineer, Employer, other Contractors and the Supply Authority is compulsory.

8. P.C. AMOUNTS

Where P.C. Amounts are specified, no part of these amounts will be used without the written approval of the Engineer. Unused amounts will be omitted from the Contract.

9. VARIATION ORDERS

Where variation orders are necessary, instructions will be issued by the Engineer and all variations will be calculated according to the priced Schedule of Quantities. All the items in the bill must be priced by the Tenderer or the tender might be declared null and void.

10. ITEMS FOR APPROVAL

Where the specification refers to a specific brand name "or similar and equivalent" or "Other approved type" and alternative equipment is offered in lieu of that specified, then written approval must be obtained from the Engineer before such equipment is installed.

In certain cases the Contractor may be required to submit samples and where necessary, tests will be performed to establish the quality of the material offered.

11. QUALITY OF MATERIALS

Only new, good quality materials may be used and where applicable materials must comply with the specifications of the South African Bureau of Standards or the British Standards Specifications.

Wherever possible, S.A. manufactured material must be used.

12. STANDARD OF WORKMANSHIP

All installation work in this Contract is to be executed by qualified Electricians and Cable Jointers in accordance with modern techniques.

The Engineer shall have the right to reject any work, which does not meet with his approval.

13. PLANT SUPPLIED BY EMPLOYER FOR INCORPORATING INTO THE WORKS

The Contractor must supply all Plant required for the erection and completion of the Works.

14. LIMITATIONS ON THE CONTRACTOR'S PERFORMANCE OF THE WORK

The Contractor shall control his activities and processes in such a way as to ensure compliance with the specifications. He shall carry out, as a minimum requirement; all the tests laid down in the specifications and shall submit all the test results to the Engineer.

The Contractor shall be responsible for the relevant Quality Assurance Requirements to be imposed on his Sub-Contractors and suppliers of materials.

The Employer's personnel as well as other Contractors will be active on site during the execution of this Contract. The inherent problems associated with this type of interaction must be taken into account and should be allowed fully for in tender prices and the Tenderer should take note of the fact that his program will be altered from time to time to accommodate the needs of the other Contractors and site conditions, everything to ensure the best co-ordination of the works in total, however not necessarily to the advantage of this Electrical Contract.

15. SITE FACILITIES TO BE PROVIDED BY THE CONTRACTOR

15.1 OFFICE, WORKSHOPS AND STORES

The Contractor shall erect and maintain at his own cost all covered storage and offices that he may require. The yard shall be fenced by the Contractor and maintenance of the yard will be his responsibility. The yard shall at all times be kept in a clean and tidy condition, to the satisfaction of the Engineer.

On completion of the project, all structures and installations shall be removed from site, to the satisfaction for the Engineer.

15.2 TELEPHONE AND TELECOMMUNICATIONS

The Contractor shall be responsible for the supply on site of his own telephone or cellular phone.

15.3 SETTING OUT

The Contractor is responsible for setting out the works to the dimensions shown on the drawings, and he will do all surveying of any supply lines. Contractor shall allow for a qualified surveyor in his pricing.

15.4 PROVISION OF STANDARD SPECIFICATIONS

Where any specification is listed and makes reference to other published standards, or specifications of a similar nature, the Contractor shall arrange at the request of the Engineers, to make available at least one complete set of the latest edition of all documents so referenced.

The documents shall be kept in the Contractor's site office where they shall be available for reference at all times by the Contractor's personnel or the Engineer until completion of the Works.

16. CONTRACT ADMINISTRATION, COMPLETION, TESTING AND COMMISSIONING

16.1 QUALITY CONTROL DURING THE EXECUTION OF THE CONTRACT

Daily inspection of the works by the Contractor is expected to ensure that all work is executed in accordance with the drawings and specifications by **an accredited 3 phase 22kV authorized installation technician/contractor's manager.**

These inspections will be monitored by the Engineer or his duly authorized Representative.

The onus is on the Contractor to clarify any uncertainties with the Engineer to ensure that the work is executed as intended by the Engineer and to the required standards.

Failure to comply might result in the Contractor redoing unsatisfactory work for his own account.

16.2 MAINTENANCE OF AS-BUILT DRAWINGS

During execution of the Contract, the Contractor shall update the drawings daily with all the relevant information regarding cable routes, joints, sleeves, etc.

At the end of the Contract, the Contractor shall provide the necessary information to enable the Engineer to prepare "As-Built Drawings" of the installation, together with 3 sets of any other drawings, wiring diagrams, services and instruction manuals for equipment supplied by him.

16.3 SETTING OF PROTECTIVE DEVICES AND CONTROLS

16.3.1 All protective devices installed throughout shall be correctly adjusted by the Contractor to the approval of the Engineer before any circuit is energized. The Contractor is required to obtain all data necessary to establish the correctness of the settings. Where doubts exist the Engineer's confirmation is to be sought. Data with regard to all commissioning documentation and diagrams of all control, alarm and indication circuits are to be provided for approval prior to their installation.

16.3.2 These diagrams shall include:

- 16.3.2.1 Wiring diagram.
- 16.3.2.2 Schematic wiring diagram.
- 16.3.2.3 Device operating sequence diagram.
- 16.3.2.4 Operational narrative of the control and protective devices.

16.4 PRELIMINARY TESTING OF MAJOR EQUIPMENT

All items of major equipment are where feasible, to be factory tested prior to delivery to site, and results of such tests, in a format to be agreed in advance, are to be produced before the equipment is delivered.

All such tests are to be in accordance with the relevant Codes of Practice, and with any other requirements as set out in this documentation.

16.5 COMPLETION OF INSTALLATION

Before the commencement of any test or commissioning procedures, the Contractor is to ensure that all nuts and bolts are securely fastened, and that paintwork on all items supplied has been touched up where damage has occurred.

16.6 INSPECTION AND TESTING

On completion of the entire installation or any particular section thereof, as may be decided by the Engineer, the following minimum tests shall be carried out in the presence of the Engineer or his authorized Representative.

16.6.1 Transformer Testing

- 16.6.1.1 Factory test results and certificates as required by SABS 780 shall be furnished.
- 16.6.1.2 Megger testing (5000 V) of insulation (MV/LV and LV/E).
- 16.6.1.3 The recording and marking of phase rotation and voltage on the secondary side.
- 16.6.1.4 MV and LV transformer earth resistance.

16.6.2 Cable Testing. MV and LV cables shall be tested by the Contractor for:

- 16.6.2.1 Continuity.
- 16.6.2.2 Insulation.
- 16.6.2.3 Phase rotation.

16.6.3 LV Testing. The tests on the LV system to be conducted are as follows:

- 16.6.3.1 Operation tests of all circuit breakers.
- 16.6.3.2 Continuity tests.
- 16.6.3.3 Megger tests (not less than 1 000 Volt).
- 16.6.3.4 Measuring and recording of clearances.

16.6.4 Documentation

All instrumentation necessary for testing shall be provided by the Contractor.

The results of all the tests must be clearly recorded, signed and handed to the Engineer or his authorised Representative. Where available standard or specifically designed forms should be used. In this regard, Tenderers are referred to any forms included in this document.

16.6.5 Commissioning, Testing And Documentation

- 16.6.5.1 On completion of the entire installation or any particular section thereof, as may be decided by the Engineer, test shall be carried out before commissioning, in full accordance with the current edition of the "Code of Practice for the Wiring of Premises", the manufacturers and/or the SABS specifications, in the presence of the Engineers or his authorized Representative.

The Contractor should note that where applicable, at least the following test must be carried out:

- 16.6.5.1.1 Phase Rotation Tests
- 16.6.5.1.2 Insulation Test
- 16.6.5.1.3 Continuity Test
- 16.6.5.1.4 Loop Line Earth Impedance Test
- 16.6.5.1.5 Polarity Test
- 16.6.5.1.6 Earth Leakage Circuit Breaker
- 16.6.5.1.7 Earth Termination Test.

- 16.6.5.2 Any further tests to meet the Supply Authorities requirements, or as deemed necessary by the Engineer.

- 16.6.5.3 All instrumentation necessary for testing shall be provided by the Contractor.

- 16.6.5.4 The results of the above tests must be clearly recorded, signed and handed to the Engineer or his authorized Representative, together with the Certificate of Compliance, or any such form or forms required by the Local Supply Authority or Engineer.

- 16.6.5.5 The Engineer requires at least the following:

- 16.6.5.5.1 Certificate of Compliance.
- 16.6.5.5.2 Schedule of protection and control settings.
- 16.6.5.5.3 Set of schematic wiring and function diagrams.
- 16.6.5.5.4 Sequence diagram and control functional narrative for each control panel.
- 16.6.5.5.5 Drawings of the installation marked "As Built" and signed.
- 16.6.5.5.6 File of distribution legends.
- 16.6.5.5.7 Operating and maintenance instructions on equipment.
- 16.6.5.5.8 List and description of clearance measurements at road crossings, Telkom crossings, between other services etc. all as per the OHS act, to determine compliance.
- 16.6.5.5.9 Guarantees ceded to the Employer.

- 16.6.6 Once the Engineer has inspected the complete installation and satisfied himself that all testing has been completed, and that the Contract is complete in all aspects, can the Employer be approached in writing, with the above documentation, with a view to arrange a hand-over date.

16.7 UNACCEPTABLE TESTS AND ABORTIVE HAND OVERS

Should the Employer or Engineer find at the time of hand over that work is defective to the extent that they have to return for further inspections and the handover aborted, then the Employer reserves the right to claim expenses in whole or part from the Contractor.

16.8 LABELLING

All new Switchgear, LV cubicles and attendant circuits, circuit breakers, transformers, cables, poles etc. shall be clearly labelled. The inscriptions to be used will be provided in the Project Specifications or after the award of tender.

17. PROGRAM OF WORK

A program shall be finalised by the successful Contractor during a meeting within 2 weeks after a Tender has been awarded. The Contractor shall only deviate from this program if the Engineer approves. However, the Engineer reserves the right to alter the program if necessary. This program shall be regarded as a binding document and the handover date shall be the date stipulated on the program. The penalty clause will be applied from the "Handover date".

Where applicable, the program will not be drawn up in isolation, but the Contractor must take cognisance of the program of the Civil and or any other Contractors on site, and should make provision to accommodate their requirements.

18. OFF-LOADING, STACKING AND LIABILITY FOR BREAKAGES

The Contractor will be required, at his own expense, to make all arrangements for off-loading and carefully stacking all plant and materials delivered under this Contract on the Site of the Works. The off-loading and stacking shall be carried out strictly in accordance with the requirements of the Engineer so as to permit a thorough and careful examination and testing of all items for breakages, fractures, etc.

Plant and materials shall be stored on site at the cost of the Contractor, who shall be fully responsible for its protection against theft or damage by water, weather, fire and any interference until such time as it is erected and installed, put into satisfactory operation and accepted by the Engineer and the Employer as complete.

19. INSPECTION AT SITE

All plant and materials will be carefully examined upon delivery at the site and all items showing defects or damage of any description shall be laid aside as not being in accordance with the requirements of the Contract, and these shall be removed and replaced by the Contractor at his own cost.

20. ERECTION, INSTALLATION, ADJUSTMENT AND OPERATION

The erection and installation of the plant is to be carried out by skilled artisans, experienced in this type of work and under the personal supervision of the Contractor's Site Foreman, whose qualifications and experience to supervise this work must be acceptable to the Engineer. The plant, when erected and installed, shall be of neat and workmanlike appearance, solidly and evenly supported, true to line and level, plumb and in proper working order. The drilling and grouting of all structural bolts, channels, etc. will be the responsibility of the Contractor under this Contract.

Before handing over the Plant, the Contractor is to ensure that every component is operating satisfactorily. The Contract will not be deemed to have been completed until the Engineer is fully satisfied in this regard.

BRAND NAMES

Brand names and references to catalogues are made to determine a standard for material to be delivered and are not prescriptive as the exact type to be used. Alternatives may be presented for approval.

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QUALITY SPEC BVELEC 01/1 : QUALITY SPECIFICATIONS

1. INTRODUCTION

The following specifications form the base quality guidelines of this document and serve to set standards to which individual components as well as the complete installation must adhere. If any deviations from or additions to these specifications should occur, it is detailed in the general and project specifications. In all cases the latest available update of the specifications mentioned applies to this contract. All material supplied must be new and undamaged and shall, where applicable, bear the SABS mark.

2. TABLE 1: QUALITY STANDARDS

ITEM	DOCUMENT
Aerial Bundled Conductor	SABS 1418, Part 1 to 3 DTS 0105 (NRS 018)
Bolts and Nuts	SABS 135
Bolts, Eye	SABS 178
Bushbars	SABS 1195
CNE	SABS 1268: 1979
	NRS 016: 1991
Cables, installation of electric	SABS: 0198: 1988
Cables, low voltage	NRS 012: 1991
Cables, medium voltage	NRS 013: 1991
Cables (house service split concentric)	DTS 0084 (NRS 017)
Cable Glands	
Cable Ties	SABS 080
Clamps (strain for split concentric)	DTS 0086 (NRS 020)
Clamps (suspension for split concentric)	
Clamps Strain	SABS 178
Clevis Tongue Adapter (twisted)	SABS 178
Clips for Wiring	
Compression Fittings	BS 3288 Part 1 (Tests)
Concrete Poles	SANS 470 DTS 0106
Conductor ACSR/AAC and AAAC	SABS 182
Conductor, Covered	DTS 0087 (NRS 021)
Conduit Saddles	
Conduit	

ITEM	DOCUMENT
Connectors, lug/termination	NRS 028 EDF 6737/HN 33 E60 (Main cable 350mm ² to 70mm ² take off 6mm ² to 35mm ²)
Connectors, mid-span/no tension	BS 3288 (Tests)
Connectors	SABS 0162
Cross Arm Braces	SABS 1200 H/HA
Cross Arms	SABS 0162 SABS 1200 H/HA
D-Fuses	DTS 0048 Rev 0
Distribution Transformers	NRS 005
Earthing Rods	SABS 1063 SABS 0199
Electricity Dispenser	SABS 1524 -1 NRS 009 -1
Fittings (strain and suspension) ABC	DTS 0105 (NRS 018)
Fuse Holder	SABS 172 & BS 88
Fuses	SABS 172 & BS 88
Galvanising	SABS 763: 1988 SABS 935
Insulator Hardware	IEC/NWS 1536, SABS 177,
Insulator Spindle	DTS 0092
Isolators	SABS 0162
	SABS 1200 H/HA
Line Construction	NWS 1512
Links Trilinks	IEC/NWS 1536
Links, ganged 3 phase (isolators)	IEC/NWS 1536
Links, pull Stick (Knife links)	IEC/NEW 1563
Links, single Pole "Huncklinks"	IEC/NWS 1536
Long Rod Insulators	DTS 0092
Miniature Circuit Breakers	SABS 156
Reticulation LV	DTS 0090 (NRS 023)
Road crossing standard	DTS 0060
Pole Top Service Box	DTS 0104 (NRS 032)
Post Insulators	DTS 0092
Performed Tension Wraps	SABS 178
Performed Ties	SABS 178

ITEM	DOCUMENT
Ready Boards	DTS 0085 (NRS 019)
Switchgear, Metal incl. ring main units (1-24kV)	NRS 006
Service Box	DTS 0104 (NRS 023)
Stay Assemblies	BS 16, SABS 0162
Stay Assemblies	BS 16, SABS 0162
Stay Insulators	BS 16, SABS 0162
Stay Wires	SABS 182, Part 5
Surfix Wiring	SABS 1507
Surge Arresters	NWS 1108, BS 2914 (NRS 039)
Symbolic Safety Signs	SABS 1186 : 1978
Thimbles	BS 464
Transformer	SABS 780
Transmission line hardware	NWS 1827
Washers	SABS 135
Wire, PVC Covered	SABS 182
Wire Rope Grips	BS 462
Wire, Stranded Copper, bare	SABS 753
Wood, Poles, pine gum	SABS 754
Zinc coatings, hot dipped galvanized	SABS 763

3. **TABLE 2: GUIDELINES AND RECOMMENDED PRACTICES**

ITEM	DOCUMENT
Overhead Reticulation: Recommended Practice for Low Cost Urban Reticulation	NRS 023: 1991 (DTS 0090)
Code of Practice for the Application of CNE on Low Voltage Distribution Systems	NRS 016: 1991 (DTS 0103)
Power Line Crossings of Proclaimed Roads, Railway Lines, Tramways and Important Communication Lines	DTS 0060
OHS Act (Act No 85 of 1993) and Amendments	
Construction Regulations and Amendments	
Eskom Standards	DT-Web

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SPEC BVELEC 01/2: LAYING OF CABLES AND EXCAVATIONS

1.1 HANDLING

The storage, transportation, handling and laying of 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.

Twisted, kinked or cables damaged in any way will not be allowed, and must be rejected.

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 short 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 of the Engineer after drawing in of the cables. The manufacturer's recommended bending radius for cables are to be adhered to at all times. Failure to these will result in the Contractor to replace the cable at his own costs, and to the satisfaction of the Engineer.

1.2 EXCAVATIONS

The excavations of cable trenches shall be carried out by the Contractor, along the routes and in the servitudes as shown on the drawings or as indicated on site.

The bottom of the trench shall be level and clear and the bottom and sides shall be free from rocks, stones, or other objects liable to cause damage to the cable.

All MV cables, unless otherwise specified, shall be laid at a depth of at least 1 000mm and LV cables at 800mm below FINAL FINISHED GROUND LEVEL OR NATURAL GROUND LEVEL.

Trenches shall not be less than 400mm wide for one or two cables, and the width shall be increased where more than two cables are to be laid together, so that the cables may be placed at least 150mm apart throughout the run.

Where the nature of the ground does not permit the excavation of cable trenches to the specified depth without excessive blasting, the matter shall be referred back to the Engineer, whose decision shall be final.

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

Volumetric measurements for normal excavations will not be done and trenches will be measured on a cost per meter basis.

The Contractor shall be responsible to remove all excess ground left over after trenches have been back filled. He will ensure that the surface is left in the same condition in which it was handed to him.

No guarantee can be given that blasting will not be necessary. This item shall be the full responsibility of the Contractor and he shall be required to adhere to all laws, regulations and by laws regarding this type of work. The onus is on the Contractor to visit the site before submitting his Tender, to make an assessment of the soil type and to allow for blasting if deemed necessary as no extra claims shall be considered.

BEDDING

In all trenches a layer of at least 100mm of clean sand shall be laid below the cable/sleeve, followed by a layer of at least 100mm clean approved bedding laid above the cable/sleeve.

1.3 CABLE WARNING TAPE

A yellow PVC cable warning tape of 300mm wide shall be installed at least 300mm above all cables in trenches.

1.4 BACKFILLING

Backfilling after bedding and laying of concrete slabs and warning tape, where applicable, is to be carried out with a proper grading of material to ensure settling without voids, and the material is to be properly compacted after the addition of every 150mm.

The surface is to be made good as previously described.

Backfilling may not commence until the entire trench has been inspected by the Engineer and where necessary, the route was recorded onto the "As Built" drawing.

1.5 RECORDING AND INSTALLATION OF JOINT AND CABLE MARKERS

Each length of power cable shall be numbered with the drum number and its exact position entered on a route drawing, and after site testing these numbers shall appear on the test sheet covering the respective length of cable and the test result.

Full details of all joints are to be submitted and each joint is to be numbered and the position, type and number recorded on the route drawing.

The Joiner's name and date of jointing, as well as the weather conditions, are to be recorded on the drawing.

At the completion of each cable section the Contractor shall install a concrete, pyramid type cable joint marker at every joint position. Also, at every deviation and branch-off and where indicated on the drawing, cable markers shall be placed. The position of each joint or cable marker must be exactly indicated on the "As-Built" cable route drawing.

CABLES

1.6 MV CABLES

1.7.1 General

Medium Voltage cables of the oil impregnated paper insulated type shall be manufactured according to SABS 97 as amended, and shall bear the SABS mark.

The following designation code shall be used when identifying cables specified.

NOTE: All cables shall have stranded copper conductors and shall have a dielectric voltage grading for "unearthed" systems, unless otherwise stated.

1.7.2 Identification

<u>Component</u>	<u>Code Letters</u>
Impregnated paper dielectric	P
Lead sheath	L
Lead-alloy B Sheath	B
Lead-alloy E sheath	E

Fibrous helical bedding or serving	S
Fibrous braided serving	X
Double steel tape armor (DSTA)	T
Single wire armor (SWA)	W
Double wire armor (DWA)	D
Anti-corrosion bedding or over sheath	C

When there is any doubt about identifying a type of cable required for a particular project, the Contractor shall immediately contact the Engineer for clarification of the code.

1.7.3 Joints and Terminations of MV Cables

General. Designs of cable joints, indoor and outdoor terminations, as well as all materials to be used for the jointing or terminating of the cable shall be approved by the Engineer prior to ordering of such materials.

The joints and terminations shall comply with the following:

Voltage withstand level	36 kV
Impulse withstand level	95 kV

The Contractor shall forward to the Engineer for his approval, full particulars of the instructions issued to the Cable Joiner prior to jointing or terminating of cables.

1.7.4 Tests before making Cable off. Before paper cables are made off, the following tests will be applied:-

- i) A crackle test shall be carried out on a sample of paper from both ends of the cables. If moisture is present, the cables shall be cut back.
- ii) A 5000V megger shall be used to assure continuity and earth resistance.

1.7.5 Terminations. The best practice shall be employed when making off the MV cable ends in the end boxes. Colours or numbers must be followed through and the phase rotation must be maintained.

The cable end boxes for all the transformers, outdoor or indoor, shall be wall or pole mounted and shall be complete with insulators with through connector rods, adapted for the aluminium cores on the inside when requested. The boxes shall be either C>I> or fabricated steel, compound filled with the filler and riser holes being the highest points in the box. Moisture gaps shall be provided in all joint boxes. The compound filling shall be done in one operation with topping up following at intervals as the compound settles.

Where the cables terminate on the transformers, the bushings shall be puttied and taped, together with the cable core.

The three screens for screened cables around each core shall be bonded to the lead and armoring by means of plumbing and connected to the earth bar by means of copper conductor of at least 70 mm². For belted cables the armoring and lead shall be bounded by means of plumbing and connected to the earth bar via a 70 mm² conductor.

The connection shall be executed carefully avoiding any heat generation at the termination under earth fault conditions.

If specified heat shrink terminations shall be used. It shall be noted that the Manufacturer's instructions shall be adhered to.

The termination shall be complete and the cable supported by means of a wooden block prior to the connection of the cable to the switch gear bushings.

The wooden block shall be installed around the cable in such a manner that the sleeves or tapes used for the termination are free from the wooden block.

Spare cables of at least 1,5 m length shall be left in the cable trench at each termination.

1.7.6 Jointing of Paper Insulated Cables

All cable jointing shall be done in a first class workmanlike manner with particular attention paid to cleanliness, insulation and undue bending of the cable cores.

No cable end shall be made off ready for jointing and left open for any length of time, but shall be completely jointed and the sleeve filled with black compound immediately thereafter.

After stripping of the armor and lead sheath, the lead of the cable shall be slightly bell-mounted after which boiled linen tape 25 mm wide and of good quality shall be wrapped round the crutch of the cable, ensuring that the tape is partly under the bell-mouth. The belting shall now be stripped back and torn off against the boiled linen tape.

Each cable core shall be taped with four layers, half lap, of boiled linen tape after which a spreader shall be inserted between the cores of each cable end.

The jointing of all paper insulated cables shall be made either by means of crimping ferrules or sweating of the jointing ferrules onto the cable cores. If crimping is used, the ferrules shall be crimped on by means of a hexagon crimping tool. Before the jointing ferrules are taped, care shall be taken that they are free of any sharp points or rough edges.

All joints on paper insulated cables shall be encased in a lead sleeve of sufficient diameter for the size of cable being jointed and this lead sleeve shall be "plumbed" on to the lead sheath of each cable.

The lead sleeve shall then be filled with a good quality black compound and topped up as the compound contracts on cooling. The black compound shall be of sufficiently high dielectric strength to withstand the voltage of the cable.

The armor and lead sheath of each cable shall be bonded together by means of plumbing on a flexible cable of adequate size in accordance with the size of the cable being jointed.

When jointing in earth trenches, a cast iron cable box shall be placed over the lead sleeve. The cable box shall also be filled with black compound.

The cable trench shall be widened where the joint will be done and at least 1,5 m of spare cable shall be provided on either side of the joint.

Prior to the jointing a plastic sheet shall be installed underneath the joint covering the sides and bottom of the trench to avoid dust or soil contaminating the joint.

1.7.7 LV PVC INSULATED CABLES

General

All low voltage cables shall be manufactured according to SABS 15- - 1970 and shall bear the SABS mark.

The voltage gradient of the PVC dielectric shall be for 600/1000 Volts and for general purpose use unless otherwise stated.

All low voltage PVC insulated cables shall have stranded copper annealed conductors, unless otherwise called for.

The following code shall be used for identifying cables:-

1.7.7.1 Identification

<u>Component</u>	<u>Code Letters</u>
PVC di-electric	PVC
PVC sheath or extruded bedding	PVC
PVC tape bedding	PVCT
Single wire armor	SWA
Earth continuity conductor in armor	ECC/SWA
Double wire armor	DWA
Concentric neutral or earth conductor	N, NE or ECC as relevant
PVC outer sheath	PVC
Where a supplementary earth core is included	G/Y

1.7.7.2 Joints and Terminations of PVC PVC SWA PVC Cables

The ends of these cables shall be made off in the conventional way with an earth bond between the armor, and the cores jointed through by means of crimping ferrules, colour to colour (no taping required).

PVC jointing kits shall be used and these shall consist of a celluloid jointing mould which shall be placed around the joint. Into this mould shall be poured a clear plastic compound which shall be allowed to set after which the jointing mould shall be removed.

No joint will be permitted in any run of cable unless specifically specified or specifically approved by the Engineer.

Terminating PVC cable shall be by means of glands and shrouds or K-Clamps. Connecting of cable cores to bolted type terminals shall be affected by means of suitably sized lugs which shall either be sweated or crimped onto the relevant conductor ends.

1.8 TESTING OF CABLE TERMINATIONS

The following tests are required:

1.8.1 Before Terminations. Prior to jointing or termination the insulation and continuity tests by means of resistance shall be done:

MV cable	:	5000V
LV cable	:	1000V

1.8.2 After Terminations. The following tests shall be carried out on completed cable sections of laid and jointed cable.

The Contractor shall be responsible for all necessary test equipment and instruments and the necessary electricity supply to carry out the test.

1.8.3 Paper Insulated MV Cables. A test voltage (either A.C. or D.C.) shall be applied between conductors and between each conductor and the metal sheath, which should be held at earth potential. The voltage should be increased to the full appropriate value, and maintained at this value for 15 minutes.

Test Voltage, V (rms)					
<u>Belted cables</u>				<u>Single core, and screened cables</u>	
Between conductors		Between any conductor and sheath		Between any conductor and sheath or screen (as relevant)	
<u>Cables for earthed systems</u>					
A.C.	D.C.	A.C.	D.C.	A.C.	D.C.
20 000	30 000	11 500	17 500	12 000	18 000
<u>Cables for unearthed systems</u>					
20 000	30 000	20 000	30 000	20 000	30 000

NOTE: Direct current tests should NOT be applied on cross-linked polyethylene cables (XLPE). All cables shall be discharged fully, immediately after each and every test.

1.8.4 PVC Insulated Cables. A 2000V megger shall be used and the insulation between phases and phases to earth shall be measured.

1.8.5 Rejected Cables. If breakdown of any cable occurs during testing it shall be replaced and/or the cable end shall be re-done. This shall be to the Engineers satisfaction and for the Contractor's account.

1.9 HANDLING

During loading and off-loading the cable drums must be handled carefully to avoid damage to the inner layers of the cable. Drums must not be dropped onto or off the delivery vehicle. If no winch, hoist or other mechanical means is available, then drums must be gently rolled down a suitable ramp or rails.

When rolling a drum of cable on the ground, it must always be rolled in the direction of the arrow stenciled by the Manufacturer on the drum flange.

Periodic rotation of wooden drums is essential to avoid drum timbers from rotting through rising damp.

Incorrect handling of drums could result in rejection of the cable by the Engineer, without additional time to the Contract, or any other compensation being granted.

1.10 INSTALLATION

The following points must be adhered to for the correct installation of cables:

- Robust cable jacks with a spindle strong enough to carry total load, shall be securely mounted and operated with the spindle level.
- The securing ropes must be cut so as to leave the inner end free to move, during unrolling operations.
- Correct wire mesh pulling stockings must be used for the drawing in of cables.
- The use of adequate, (approximately every 2 metres) well-oiled cable rollers, of the correct size or larger, shall be used.

- All pipe ducts must be cleared of all foreign matter before cables are pulled in. Adequate protection and attention at the entrance and exit to pipe ducts is essential. Maximum pulling forces specified by the Manufacturers must not be exceeded.
- No cables must be laid when temperature is 10°C or lower, unless the special conditions as required by the Engineer have been fully met.
- The following bending radius is the absolute minimum and under no circumstances must the radius be less than these dimensions for the size of cable specified:
 - PVC insulated cable = 10 x D
 - Paper insulated lead covered = 12 x D
 - XLPE insulated cables = 15 x D

Where D = overall sheath diameter

The Engineer reserves the right to reject any cables which have been twisted, kinked or damaged in any other way, without additional time being granted for completion of the Contract.

When laying the cable, a certain “snaking” must be permitted so that contraction during cold weather will not detrimentally affect joints, etc. Due allowance for this has been made in this specification.

1.11 DEPTH OF CABLES

Unless authorized otherwise in writing, cable depths to underside of cable shall be as follows:

	Single or 3 per trench (max)	When tiered
i.) MV Cables	1000 mm	1 050/900 mm
ii.) Pipes/ducts under roads for cables	900 mm	900 mm
iii.) LV Kiosk supply cables only	800 mm	900/750 mm
iv.) Street-lighting, high mast or service connection cables only in street reserves	750 mm	900/750 mm
v.) Cables in common trench with MV cables	800 mm	900/750 mm
vi.) MV Cables, across domestic public open spaces, Church, schools, etc. sites	1 200 mm	1 200/1050 mm
vii.) LV Cables across domestic, public open spaces, Church, school, etc. sites	900 mm	900/750 mm

Where the above conditions cannot be met, the Engineer may approve one of the following:

- i) Cement slabs over the cables or
- ii) Cable duct pipe encased in 300 mm square concrete.

Reference must be made to detailed specifications relative to road crossings and trenching.

1.12 MARKING OF CABLES

All cable joint and route markers shall be approximately 250 mm long and 160 x 140 mm at the base and 100 x 80 mm at the top.

Cast into the top of the cable marker shall be a 80 x 60 mm x 1,6 mm stainless steel insert on which the details of the cable shall be clearly stamped. Insert to be noticed to assist holding.

Letter sizes on route markers shall be approximately 10 mm minimum.

Joints shall be marked showing size of the cable, as well as the voltage, i.e.

- i) 150 LV Joint
- ii) 35mm² 22kV Joint

Route markers shall show the direction of the cable run, the size of the cable and the number of cores.

- i) 150 LV Cable
- ii) 35mm² 22kV Joint

Cable route markers shall be placed at

- i) Approximately every 30 metres along a straight run and
- ii) Above every change of direction of the cable.

Where cables terminate at a substation or a kiosk, the cable shall be marked by means of 10 mm wide copper or stainless steel strap fixed approximately 500 mm above ground level showing the circuit designation with reference to the drawing. PVC or plastic markers will not be permitted.

1.13 MEASUREMENT OF CABLES

Quantities as shown on the Schedule of Quantities are approximate and the successful tenderer shall physically measure the route on site before ordering his cable.

All surplus cable at the end of the contract must be removed by the Contractor and the quantities for payment will be adjusted accordingly.

Cables shall be measured by the clerk of works by means of a measuring wheel once the trenches have been closed.

In addition to the cable lengths measured in the trenches, THE FOLLOWING SLACK WILL BE ALLOWED:

- i) Slack in cable trenches **+0.5%**
- ii) 11/22 kV at mini-substations **+ 3 m**
- iii) 11/22 kV at brick substations (actual measurement)

iv) 11/22 kV at overhead poles + 10 m

1.14 THERMAL RESISTIVITY

Cable current carrying capacity is affected by the thermal resistivity of the substances encountered.

The following table of values shall be used:

(g) Thermal Res. °Cm/W

Water logged ground	0,50
Concrete	0,90
Gravel	1,00
Sandy soil	1,20
Clay	1,60
Chalky soil	1,80

Impurities such as slag, ash and intense vegetation in the cable trench cause an increase of “g” and must be avoided, particularly close to the cable.

1.15 POSITIONS OF CABLES

The centre line of the trench for a single cable shall be 1 000 mm from the official property boundary line pegs (fences may not be correct) unless written instructions to the contrary, are issued.

Where two or more cables are placed in a single trench and the cable are spaced at 150 mm centers, then the trench centre line shall be 1 000 mm from the official property boundary line pegs.

1.16 TESTING ON COMPLETION

Tests on completion shall be carried out on site in the presence of the Engineer, and the test results properly recorded and submitted in triplicate.

On each completed section of laid and jointed cable, the insulated resistance shall be tested on approval, with an approved “Megger” type instrument of not less than 5 000 Volts for MV and 1 000 Volts for LV. LV Low voltage has reference to 1 000 Volts and less while MV medium voltage has reference to more than 1 000 Volts.

On each completed section of laid and jointed MV cable a high voltage test shall be carried out. The test shall be performed in the same manner as that described in clause 8.3 of SABS 97 : 1959 (as amended) but alternating or direct current may be used at the following voltage values:

Cable Voltage Rating (volts)	Test Voltage (volts)			
	Between conductors		Conductors to Sheath	
	AC (rms)	DC	AC (rms)	DC
11 000	20 000	30 000	11 500	17 500

All MV and LV switchboards shall be “Megger” tested to approval after erection and installation on site, using the applicable test voltages.

1.17 INSTALLED ROUTE PLAN AND CABLE SCHEDULES

The Contractor is responsible to submit a final cable route plan (as installed) to the satisfaction of the Engineer.

Failure to comply with this requirement will result in the delay of the issuing of the acceptance certificate. No completion certificate will be issued if these requirements are not met.

The following shall be indicated on this route plan in a satisfactory manner for all installed cables:

- a) The route length for each cable as well as distances between joints.
- b) Cable route with references to fixed points.
- c) Cable joints with references to fixed points.
- d) The cable drum number for each length.
- e) Positions of cable route markers with reference to fixed points. The route markers shall be numbered and a separate drawing showing the face plates of all route markers (numbered), with North reference shall be submitted.

A site plan shall be provided to the Contractor for this work, who shall submit a plastic film and four (4) paper prints of the route plan.

Any uncertainty in this respect shall be cleared before submission of the Tender.

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SPEC BVELEC 01/3: EARTHING

2. EARTHING

2.1 SCOPE

This specification covers the supply, installation, connection and testing of earthing systems.

2.2 INTERPRETATION

Supporting Specifications

Project Specification
SABS 1500 SA
SABS 1500 SB
SABS 1500 SC
SABS 1500 SD
SABS 1500 SE
SABS 0142

2.3 APPLICATION

This specification contains clauses that are generally applicable to substation installations, underground and overhead reticulation systems, and the wiring of premises. Interpretations and variations of this specification are set out in Part 2 of the Project Specification, which follows this specification in the Contract Document.

2.4 DEFINITIONS

For the purpose of this specification, definitions given in the specifications listed in 2.1 above and the following definitions shall apply:

2.4.1 Earth Continuity Conductor

An electrical conductor of copper, or other approved metal, of sufficient cross-sectional area as to ensure at all times an immediate discharge, without danger, of electrical energy to the general mass of earth through an earth point.

2.4.2 Earth Conductor and Earth Wire

Commonly accepted terms for an earth continuity conductor.

2.4.3 Earth Point

A metallic device, usually of copper, that is in direct contact with earth. An earth point may consist of a spike, or a number of spikes, driven vertically (usually) into the ground to sufficient depth to make contact with soil strata of such resistivity that it can safely dissipate electrical energy. An earth point may also consist of a copper mat of sufficient area and buried at sufficient depth to achieve the same results. It may also be a combination of both spikes and mat.

2.4.4 Earth Spikes

A steel cord copper rod that can be driven into the ground to a depth necessary to obtain the resistance values required. A spike may consist of a number of lengths of such rods mechanically joined together.

2.4.5 Trench Earth

A length of bare copper conductor buried in the earth at a depth of not less than 500mm and of sufficient length to obtain the resistance values required. A trench earth system is usually only employed as a main earth point when ground conditions preclude the use of spikes or mats.

2.4.6 Earth Electrode

A conductor buried or driven into the earth for the purpose of providing a connection with the earth, and the term encompasses earth spikes, earth mats, and trench earths.

2.4.7 Earth Bar

A length of copper or brass bar of appropriate or specified dimensions, or cross-sectional area, that has a sufficient number of connection points onto which earth continuity conductors or earth wires can be mechanically joined with bolts and nuts or machine screws as applicable.

2.5 ABBREVIATIONS

For the purpose of this specification the abbreviations given in the specification listed in 2.1 above and the following abbreviations shall apply:'

BCEC : Bare Copper Earth Conductor
EB : Earth Bar
ECC : Earth Continuity Conductor
EW : Earth Wire

2.6 MATERIALS

2.6.1 Conductors

Only material manufactured from or combined with, as appropriate electrolytic copper, shall be used for underground reticulation and internal wiring earthing systems.

Bare copper conductor or PVC insulated copper conductor shall be employed as may be specified or appropriate. Bare copper conductors of 16mm² and greater cross-sectional area that are intended to be buried in the ground shall, preferably be of the stranded type.

Aerial earth conductors in overhead reticulation systems may be of other metals such as aluminium alloy and galvanized steel wire as may be specified in the project specification.

2.6.2 Connections

All connection of earth continuity conductors shall be made with brass bolts, nuts, washers, together with a star lock washer, on all outdoor equipment such as mini-sub and outdoor mounted switchgear. Connection to indoor equipment in brick-built substations and switch rooms may be made with high tensile cadmium plated bolts, nuts and washers, with a steel spring washer.

2.7 CONSTRUCTION EQUIPMENT

All necessary equipment for the driving of earth spikes in the ground, and for excavation for burying earth mats and conductors, shall be provided on site by the Contractor.

2.8 INSTALLATION

2.8.1 Distribution Circuit Earth Conductors

Earth continuity conductors shall run with all cables constituting a low voltage distribution system. All earth conductors shall be bare copper wire complying with the appropriate Regulations, unless specific sizes are specified. A single earth conductor may be used where two or more cables run together, providing the earth conductor cross-sectional area is based on the largest size cable in the run, and that the branch earth wires being solidly connected to the main earth conductor where required. The earth continuity conductor shall be terminated on the main earth bar.

An earth conductor of 70mm² bare stranded copper shall be connected to the copper earth jumper and to the earth continuity conductor (ECC) which runs with the distribution cables. The connection to the ECC shall be made by using copper welding only.

The connection of branch earth wires to main earth conductors shall be by copper welding. Brazing is not acceptable.

2.8.2 Earth Points

At each item of M.V. switchgear, transformer, cradle termination, mini-sub and set of lightning arrestors, or in any instance where maintenance may be required to be done to equipment mounted on a pole, e.g. a recloser or gang links, 5,5m long and 16mm minimum diameter "Copper weld" or equivalent earth spikes shall be driven vertically into the ground, as close to the equipment as possible. No earth spike shall be within 6m of any other such spike. The number of spikes required to obtain the resistance set out below will be dependent upon the soil resistivity, but there shall be no less than three spikes at each sub-station and not less than two spikes at each outdoor switchboard, mini-sub and transformer. One spike shall be provided at cradle earthing points, reclosers, or set of lightning arrestors.

Gang links are to be earthed by an earth electrode installed 2m from the isolator handle, on the opposite side of the pole or structure and connected to the pole top steel work by means of 35mm² PVC insulated earth conductor. An earth mat 1m x 1m with a 200mm mesh fabricated from 20mm x 3mm flat copper tape is to be provided at a depth not exceeding 150mm below ground at the operating position and connected to the operating handle with 35mm² PVC insulated earth conductor.

At all mini-sub, a minimum length of 30m of 70mm² bare copper conductor shall be laid below the plinth and shall be connected to the earth bar within the mini-sub.

The top of earth spikes or uninsulated earth conductor shall not be less than 500mm below ground level. Above this level all earth conductors shall be insulated.

A marker similar to a cable marker shall be installed above each earth spike or earth mat and labeled "Earth Spike" or "Earth Mat" as appropriate.

2.8.3 Earth Point Values

The maximum values of earth electrode resistance required are 1 ohm at any mini-sub or transformer neutral, 2 ohms at any indoor or outdoor switchboard, or M.V. gang links and 3 ohms at cradle earthing points, lightning arrestors or other pole mounted equipment. Where the number of spikes stated above does not achieve these values, the Engineer is to be advised and he will give further instructions for the improvement of the values obtained. The contribution of all connected underground earth continuity conductor is to be included in the resistance value measured.

2.8.4 Earth Point Connections

The connection to each earth spike shall be by means of at least two non-ferrous mechanical clamps of an approved type for this duty. Brazing will not be accepted.

A 70mm² minimum, green insulated stranded copper earth conductor shall connect the earth electrodes to one another and a single main earth conductor of the same size shall connect on the earth electrodes of the earth mat to the main bar at the sub-station, mini-substation, equipment, transformer or cradle as appropriate.

A terminal lug shall be crimped onto the end of the main earth conductor for bolting to the main earth bar of a sub-station or mini-sub or any other outdoor equipment. Two mechanical clamps shall be used for connection onto cradles or other equipment, as appropriate.

The neutral terminal on the L.V. side of each transformer shall have an uninterrupted connection by means of a stranded copper green insulated conductor to the main earth bar, or earth spike in the case of a pole mounted transformer, the size being in accordance with the appropriate Regulations. In the case of transformers or mini-subs feeding distribution systems, the neutrals of which are multiple earthed, the transformer neutral must be earthed.

The common leg of the secondaries of CT's, other than the secondaries of summation transformers, shall be effectively earthed to the main earth system.

Earth connections must not, in any circumstances, be carried through metal conduits or sleeves.

2.8.5 Earth Bars

The main earth bar for a substation shall consist of 50mm x 6mm copper bar of a length sufficient to accommodate at least six (6) connection points at 40mm centers. The bar shall be mounted on porcelain, or equal insulators in a suitable position on a wall or plinth, and shall be readily accessible for inspection. Connections from equipment to the bar shall be 70mm² conductor, terminated in compression type lugs.

Where equipment is bolted together, as in the case of an M.V. switchgear panel, there is to be a 25mm x 3mm copper earth strap extending the whole length of the equipment. All earth bars shall be run in one continuous length as far as possible, and shall not be bent or be de-formed in any way that requires hammering or severe distortion. Any joints shall be lapped with at least two bolts with nuts and washers of suitable size. The lapped ends shall be pre-tinned. If multiple straps are used, they shall be bolted and fixed together at not more than 750mm intervals.

2.9 TOLERANCES

The Degree of Accuracy as defined in SABS 1500 SA shall apply.
Degree of Accuracy II shall apply to all work covered under this Specification.

2.10 TESTING

2.10.1 Tests on Site

The Contractor shall test the earth resistance of each earth system, using the respective earth bar or termination as the reference point. As stated above, should the required values not be achieved, the Engineer shall be informed, and he will then give the required instructions.

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SPEC BVELEC01/6 BUILDING ELECTRICAL INSTALLATIONS

1. NOTICES AND FEES

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

The following documentation must be provided with tender of electrical contractor/sub-contractor responsible for this specific specialist installation:

7. Plant and Equipment,
8. Labor content,
9. Company organogram,
10. Company profile,
11. Proof of labor force,
12. CV's & certificates,
13. Reference letters,
14. Completion certificates.

2. SCHEDULE OF FITTINGS

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

3. QUALITY OF MATERIALS

Only materials of first-class quality shall be used and all materials shall be subject to the approval of BVi.

Wherever applicable the material is to comply with the relevant South African Bureau of Standards specifications, or to British Standard Specifications, where no SABS Specifications exist.

Materials wherever possible, must be of South African manufacture.

4. CONDUIT AND ACCESSORIES

The type of conduit and accessories required for the service, i.e. whether the conduit and accessories shall be Galvanized, 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 SABS 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: SABS 1065. Part 1 and 2.

(b) Plain-end metallic conduit and accessories: SABS 1065. Parts 1 and 2.

(c) Non-metallic conduit and accessories: SABS 950.

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 size 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 manufacturer 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.

NOTE

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, 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 50km of the coast shall be galvanised to SABS 763.

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 to any claim submitted by the Contractor, which may result from a lack of knowledge in regard to the Supply Authority's requirements.

5. 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 crampers 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 450mm throughout the installation. 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.

6. 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 leveled 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 sliced couplings as a locknut.

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 boxes are to be provided at the junction. The finish of the boxes and positioning shall follow 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 should run along the wall plates and tie beams.

In buildings where building operations are to be carried out, all surface conduits will be painted by the Building Contractor.

In all other instances, the Electrical Contractor shall allow for painting of surface conduit with two coats of good quality enamel paint, and the colour shall match the surrounding building finish.

Only approved plugging materials such as aluminium inserts, fiber 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.

7. 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 have a representative in attendance at all times 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 preferably 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 in cast, all conduit droppers to switchboards shall be neatly spaced and rigidly fixed.

8. FLEXIBLE CONNECTIONS FOR CONNECTING UP TO STOVES, MACHINES, ETC.

Flexible tubing connections shall be of galvanized steel construction, and in damp situations of the plastic sheathed galvanized steel type. Other types may only be used subject to the prior approval of site Electrical Representative.

Connectors for coupling onto the flexible tubing shall be of the gland or screw-in types, manufactured of either brass or cadmium or zinc plated mild steel, and the connectors after having been fixed onto the tubing, shall be durably sound.

Note:

Aluminium and zinc alloy connectors will not be acceptable.

9. WIRING

Except where otherwise specified in the specification, wiring shall be carried out in Bosal conduit throughout. Maximum of 2 circuits 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 1,5mm² or thicker conductors and a 2,5mm² earth conductor – refer to DB drawings. For socket outlet circuits the wiring shall comprise 4mm² conductors and a 2,5mm² earth conductor. In certain instances, as will be directed in Part 2 of this specification, the sized of the aforementioned conductors may be increased for specified circuits. Sizes of conductors to be drawn into conduits 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 600/1000V grade cable to SABS 150.

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.

10. SWITCHES AND SOCKET OUTLETS

All switches and switch-socket outlet combination units shall be metal type with steel covers to conform to BVi's Specifications and drawings.

All light switches shall be installed at 1,4m above finished floor level and all socket outlets as directed in the Schedule of Fittings which forms part of this specification or alternatively the height of socket outlets may be indicated on the drawings.

11. SWITCHGEAR

Switchgear, which includes circuit breakers, iron-clad switches, interlocked switch-socket units, contactors, time switches, etc., is to be in accordance with BVi. The 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 manufacturer of each of the different classes of switchgear mentioned in the Quality Specifications shall be used throughout the installations.

12. SWITCHBOARDS

All boards shall be in accordance with the types as specified, be constructed according to the details as shown on the schematic drawings and must be approved by BVi, 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 board proposed as an alternative to that specified, must have the prior approval of BVi.

All bus bars, 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 end boxes and other ancillary equipment must be provided where required.

Clearly engraved labels are to be mounted on or below every switch. The wording of the labels in both official languages is to be according to the lay-out drawings or as directed by BVi representative and must be confirmed on site. Floor Standing board to be installed with the top of the board 2,0m above the finished floor level.

13. WORKMANSHIP AND STAFF

Except in the case of electrical installations supplied by a single-phase electricity supply at the point of supply, an accredited 3 phase electrician shall exercise general control over all electrical installation work being carried out.

The workmanship shall be of the highest standard and to the satisfaction of BVi.

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

14. CERTIFICATE OF COMPLIANCE

On completion of the service, a Certificate of Compliance must be issued to BVi's Representative/Agent in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).

15. EARTHING OF INSTALLATION

The type of main earthing must be as required by the supply authority if other than BVi and in any event as directed by BVi's Representative, 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 BVi's authorised representative.

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 insulation.

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 1,60mm solid copper strapping or 16mm⁵ stranded (not solid) bare copper wire or such conductor as BVi's Representative may direct. Main earth copper strapping where installed below 3m from ground level, must be run in 20mm diameter conduit securely fixed to the walls.

All other hot and cold-water pipes shall be connected with 12mm x 0,8mm perforated or solid copper strapping (not conductors) to the nearest switchboard. The strapping shall be fixed to the pipe work with brass nuts and bolts and against walls with brass screws at 150mm 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

Where service connections consist of overhead conductors, all metal parts of roofs, gutters and down pipes shall be earthed. One bare 10mm 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 0,8mm 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 bus bar in each sub-distribution board and the earth bus bar in the main switchboard. These connections shall consist of 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 utilized where specified or approved.

Sub-circuits

The earth conductors of all sub-circuits shall be connected to the earth bus bar in the supply board in accordance with SABS 0142.

Ring Mains

Common earth conductors may be used where various circuits are installed in the same wire way in accordance with SABS 0142. In such instances the size 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 installed in the wire way, alternatively the size of the conductor shall be as directed by the Engineer. Earth conductors of individual circuits branching from the ring main shall be connected to the common earth conductor with T-ferrules or soldered. The common earth shall not be broken.

Non-metallic Conduit

Where non-metallic conduit is specified or allowed, the installation shall comply with the standard quality specification for "conduit and conduit accessories". Standard copper earth conductors shall be installed in the conduits and fixed securely 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 utilized 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.

16. MOUNTING AND POSITIONING OF LUMINAIRES

The Electrical 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 lay-out of the luminaires as indicated on the drawings must be adhered to as far as possible and must be confirmed with BVI's 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.

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.

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".

17. OWNERS MATERIAL

When certain materials are supplied by the Owner to the Contractor for installation, the Contractor must arrange for taking delivery and providing safe storage for these materials.

The Contractor will be held responsible for all damage to or loss of such material while it is in his custody.

18. DELAY & PAYMENT

Delay

If the Electrical Contractor's work should cause any delay to the contract, he will be held responsible for any claims arising out of such delay.

Payment

Payment for the items scheduled under this specification will be as follows:

On delivery of said equipment to site, 80% of the value of the applicable items may be claimed.

On completion of installation of said equipment to the satisfaction of the Engineer, a further 15% of the value of the applicable items may be claimed.

On completion of the commissioning and testing of the entire plant to the satisfaction of the Engineer, a further 5% of the value of the applicable items may be claimed.

19. TEST

The Electrical Contractor will be required to sign an Indemnity Form upon completion of the service, **before First Delivery will be taken**, to SANS 10142 – latest revision.

In addition, all Earth Leakage Relay Units shall be tested in accordance with the “Code of Practice”, using approved earth leakage testing equipment.

20. QUALITY OF WORK

Compliance with regulations:

Where applicable, the installation shall comply in all respects with;

- a) The latest issue of SANS 10142; “Code of Practice for the Wiring of Premises.”
- b) The Occupational Health and Safety Act 1993 (ACT 85/1993).
- c) The Municipal By-Laws and any special requirements of the Local Supply Authority
- d) The Local Fire Regulations and,
- e) The National Building Regulations and Building Standards Act 1977 (ACT 103 of 1977 as amended.)

21. CONDUIT AND WIRING

Conduit and conduit accessories shall be galvanized type, conduit with SABS 162, 763 and 1007 respectively.

NOTE:

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.

All light switches, switch socket outlet shall be metal type mounted in yolk box.

22. MAKING GOOD

The Electrical Contractor will be responsible for keeping the site clean and tidy and shall remove all litter and rubbish resulting from the construction of the Electrical Works, and must make good all the positions of existing equipment that will fall away, to the satisfaction of the Engineer.

23. EARTHING AND BONDING

The Electrical Contractor will be responsible for all earthing and bonding of the entire building and his complete installation.

The earthing and bonding is to be carried out strictly as described under SANS10142 and to the satisfaction of the Engineer.

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SPEC BVELEC01/04: MOTOR CONTROL CENTRES

1. SCOPE OF WORKS

The Clanwilliam WWTP treats domestic sewage from the town of Clanwilliam at a rate of 2 100 m³/day. The flow is both fed under gravity and pumped into the plant. The plant is operational 24/7. The contractor must take note that the plant can only be switch off for a limited time period. A detailed method statement, as well as program with cashflow will be required upon award. The approximate time frame for completion is 4 months.

Detailed Specification

- 1) Detailed Design with O M Manuals
- 2) A new Motor Control Centre will be required.
- 3) A new PLC with a 12" HMI and UPS
- 4) New cabling and stop start stations
- 5) PID flow diagram
- 6) Control Philosophy
- 7) Functional Description specification (FDS)
- 8) PLC Programming (Function Blocks)
- 9) HMI and/or SCADA mimics

1.1 QUALIFYING CRITERIA

Bidder must have in his full time employ a registered installation Electrician AND/OR Electrical Technician with a valid wireman's license for signing off on all electrical installations and providing the necessary certificate on completion. Documentary evidence in this respect, i.e., copy of registration certificate, CV, qualifications, etc. must be provided.

1.2 SITE CONDITIONS

The Tenderer shall take cognisance of the fact that the plant is currently in operation and a minimum disruption to the operation is required.

Motor manufacturers, switchboard manufacturers, electrical equipment manufacturers, are all warned that the motor and associated control equipment are to be installed in an extremely corrosive and often damp environment. The motor and allied equipment shall therefore be adequately protected

2. STATUTORY REGULATIONS PERTAINING TO ELECTRICAL WORK

CONTRACTOR BASES	78
Except in accordance with the specified or implied the contract work and equipment supplied shall comply with the latest revisions of the standard specifications listed, including generally:	78
CONTROL SWITCHES	78
• SANS 10142-1:2012 (Edition 1.8).....The wiring of Premises, Part 1: Low voltage installations	78
Maintenance/Normal Switch	78
• SANS 10400 A:2010 (Edition 3).....The Application of the National Building Regulations, Part A: General principles and requirements	78

Where a SANS Standard does not exist or if not applicable, the relevant IEC or BS Standard shall be applicable.

The equipment supplied and work carried out shall fully meet and comply with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations 2003 issued in terms of Section 43 of the Act, Standards South Africa (a Division of the South African Bureau of Standards {SABS}) and all other statutory regulations and laws insofar as they may apply to an electrical installation of the type contemplated.

In the event of discrepancy between any of the specifications, regulations and codes of practice, the SANS 10142-1 Code of Practice for Wiring of Premises shall take precedence.

All references to "SABS" specifications shall be read as "SANS" considering the recent changes by the South African Bureau of Standards.

Additionally, the following specifications, whether specifically mentioned within the tender document or not, shall also apply:

- | | |
|--|--|
| • SANS 10111-1:2011 (Edition 3.2) | Engineering Drawings, Part 1: General Principles |
| • SANS 1091:2012 (Edition 2.1) | National colour standards |
| • SANS 156:2007 (Edition 3.3) & VC8036:06 Oct 2006 (Edition 3) | Moulded case circuit breakers
Compulsory specification for circuit breakers |

3. GENERAL REQUIREMENTS

3.1 DRAWINGS

3.1.1 Contractor's Drawings

Workshop drawings of proposed Motor Control Centres, Field Control Stations, Local Distribution Boards, as well as any other switchboards are required for approval by the Engineer prior to fabrication.

Record drawings (previously termed "as-builts") of the installation indicating cable routes, sleeve positions and circuit wiring details are required on completion. All these record drawings must be checked and signed by the sub-contractor before submission to the Engineer.

A full set of schematic drawings and wiring diagrams shall be handed over at the end of the Contract; including all switchboards, motor control centres, distribution boards, field control stations etc.

The Contract will be deemed incomplete until the Contractor has handed all these drawings over to the Engineer who shall provide his final acceptance in writing.

3.2 LOCKOUT PROCEDURE/PERMIT TO WORK FORM

The Directorate: Water and Sanitation of this Council has implemented a system whereby any party entering and/or proposing to undertake any electrical works on any of its premises or sites, is to be issued with a permit to undertake work, which is available from the respective Plant Manager etc. Work MAY NOT be undertaken in any form or context if this permit is not issued and validated by the Authorised personnel onsite.

All low voltage (below 1000 Volts) work onsite at any of this Council's premises requires a written Permit to Work to be issued by the Control Officer (Tel: 021 514-3641) or his duly appointed representative.

Any work onsite at any of this Council's premises requiring excavation (for example excavation of cable trenches) requires a Wayleave to be issued by the relevant Electrical Supply Authority i.e. Eskom or the City of Cape Town Electricity Department. This Wayleave shall be reviewed and endorsed by the Engineer or his duly appointed representative (Control Officer).

3.3 LOCKS

The Tenderer shall supply locks whilst completing the work at hand. This Council shall supply locks for all the equipment on completion of commissioning.

3.4 VOLTAGE DROP

Unless otherwise stated, the permissible voltage drop within low voltage installations from the Point of Common Coupling (PCC) shall be calculated as follows:

“1v plus 2% of the voltage at the end of the circuit when the entire circuit is fully loaded”.

The PCC on low voltage installations shall be the respective transformer low voltage terminals.

3.5 CONTROL VOLTAGES

Control Voltages within Switchboards shall be deemed to be 110 - 240 V AC / 24V DC (Or as detailed in Project specification). Control voltages for remote field equipment, for example Start/Stop stations, shall be 230V AC. If an existing installation is to be expanded, the existing control voltage shall remain.

4. SWITCHBOARD STANDARDS (MOTOR CONTROL CENTERS, DISTRIBUTION BOARDS, TRAYS, BOXES, ETC.)

4.1 GENERAL

The manufacture of LV Switchgear and Control gear ASSEMBLIES also referred to as motor control centres (MCC's) and distribution boards (DB's) {both collectively referred to as in this specification as “ASSEMBLIES” or “switchboards”}, shall be “Type Tested” modular type distribution boards and shall strictly comply with the latest revisions of the following standards:

SANS 60439-1 tested,	‘LV Switchgear and Control gear ASSEMBLIES Part One: Type-tested, Partially Type-tested ASSEMBLIES’.
SANS 60439-2	‘LV Switchgear and Control gear Part Two: Busbar Trunking’
SANS 1973-1 tested,	‘LV Switchgear and Control gear ASSEMBLIES Part 1: Type- ASSEMBLIES with stated deviations and rated short-circuit withstand strength above 10kA.
SANS 1973-3 with a	‘LV Switchgear and Control gear Part 3: Safety of ASSEMBLIES rated prospective short-circuit current of up to and including 10kA.

For ASSEMBLIES equal to or greater than a 10kA rating, switchboard manufacturers shall be in possession of a minimum of the test reports required as defined in SANS 1973-1.

Only authorized holders of these test reports may design and construct the ASSEMBLIES.

Copies of relevant test reports shall be made available to the Engineer immediately upon request.

Should this information not be presented to the Engineer upon request, Engineer reserves the right to call for another manufacturer to supply equipment that complies

with this requirement and no compensation in any form shall be granted to the non-compliant party.

Notwithstanding any requirements of SANS 1973-1, the manufacturer of the ASSEMBLY (including the busbar assembly and mounting), shall re-torque the busbars onsite once fully populated and connected-up, prior to switch-on, and shall issue a certificate to the Engineer detailing that the bus-bar arrangement is still to the same standards as at the time of initial construction and is safe for operation.

Suppliers/Manufacturers of switchboards shall be in possession of a Permit to Apply the Certification Mark, issued by the South African Bureau of Standards, in terms of the Specific Permit Conditions of SANS 1973-1 and SANS 1973-3.

ASSEMBLIES shall be fitted with a metal label, clearly displayed, detailing the information required by SANS 1973-1 and SANS 1973-3 as applicable.

4.2 MCC Preferred Design Requirements

The following requirements shall be assumed correct unless altered in the Project Specification:

Mounting:	Floor standing
Access:	Front and rear access
Sectioning:	Multi-section, Form 3b or Form 4 to SANS IEC 60439
Manufacture:	2.0 mm and 1.6 mm 3CR12
Finish:	Painted Light Orange – B26 (SANS 1091:2012) external, White arc-free internal
Cable Entry:	Incoming & Outgoing – bottom MCC gland plates shall be 3CR12 sheet steel, unpainted or Aluminium, cross-bracing between every 2nd tier, hot-dipped galvanised
Doors:	Lockable
Protection:	IP44 (panels fixed); IP12 (panels removed)
Functional Units:	Removable but not fully withdrawable
Electrical Details:	400V, 50Hz, 3 Phase with full Neutral
Earthing Details:	Full length, rear of switchboard All earthing bars to be tinned copper.
Electrical Ratings:	MCC Fault level to be to Transformer Secondary Output Symmetrical fault level, 3 second rating, applicable to Main and Distribution busbars.
Dimensions:	Height: 2000mm (max) Depth: 400mm/600mm (standard)/800mm Cubicle Size: 600mm (width) x 400mm (height) (MINIMUM) Or 800mm (width) x 400mm (height) (MINIMUM) Cubicle/Door Panel Spacing: 40mm horizontal 20mm vertical

Note that cubicle height may be 385mm provided that the width is greater than 600mm.

An 800mm wide cubicle may be divided into 2 x 400mm cubicles (minimum 600mm cubicle height).

Panel vertical dimensions may not exceed 2 000mm as panel needs to be passed through a standard height doorway.

(Cubicle sizes may vary but only subject to written approval by the Engineer)

Positioning/Clearances: Switchboards (free standing) are to be positioned within existing or proposed switch rooms such that the following clearances are maintained:

At rear of switchboard = 1000mm

At each end of the switchboard = 1000mm

In front of switchboard = 2000mm

On top of switchboard = 700mm (bottom entry panels)

On top of switchboard = 900mm (top entry panels)

The Engineer shall be the sole arbitrator in disputes relating to adherence to these and the general technical specification standards.

4.2.1 Hold Points During Manufacture

The following hold points require action and shall be adhered to prior and during the manufacturing process. Each step shall be completed in turn, requiring an inspection of the switchboard at the manufacturer's premises and requiring the written acceptance of the Engineer for each step, prior to acceptance:

- Board Design
- After manufacture of metal work, prior to painting
- After painting, prior to installation of equipment (switchgear etc.).
- Prior to delivery to site (at the sole discretion of the Engineer who may call for on-load testing in the manufacturer's workshop)

Should these points not be followed and the item in question proves to be incorrect, it shall be for the manufacturer/tenderer/contractor to undertake to repair the situation at his own cost.

4.2.2 Switchboard Preferred Tier Arrangement/Layouts

Switchboards are to generally comply with the following, but these guidelines may be altered due to the specifics of the installation:

- For switchboards with a single incomer, this cubicle and tier shall be positioned on the entrance side of the switch room
- For switchboards with a single incomer and a generator incomer, these cubicles and tiers shall be positioned in the middle of the switchboard.
- For switchboards with two incoming mains feeders as well as optional and generator supplies, these cubicles and tiers shall be position in the middle of the switchboard.
- PLC and Instrumentation dedicated Tiers shall be positioned within the switchboard on the side furthest from the entrance.
- Bus-section switches shall be position in the middle of the switchboard adjacent to incomer tiers and cubicles.
- Redundant/duplicated equipment shall be positioned on either side of a bus-section where practical.

4.2.3 Grouping of Equipment

Each motor circuit shall be individually protected by a circuit breaker dedicated to the respective motor circuit. A single circuit breaker protecting multiple motor circuits will not be permitted.

Only one motor drive per cubicle is required. Where motors operate as a single group, these shall be controlled as a single motor.

A motor drive cubicle which houses multiple motor drives shall only be permitted, when all the motor drives in the group are dedicated to a single item of equipment and all the motors operate as a group.

When a single motor, within any one group of motors which has been selected for automatic operation, trips or is isolated, all the motors within the group shall stop and shall be prevented from being restarted by electrical interlocking.

4.2.4 Door Interlocking on Switchboards

A circuit breaker shall provide the means of isolation to each motor drive cubicle, or a cubicle housing a group of motor drives which forms part of the MCC. The operating lever, of the circuit breaker mounted within the cubicle, shall be coupled to an operating handle fitted to the cubicle door and interlocked such that the door may not be opened with the circuit breaker in the "on" position. The operating handle shall be padlock able in the "off" position. Auxiliary contacts shall be provided, on the circuit breaker, to isolate the control circuit.

Refer to OHS Act (Act 85 of 1993), Section 14 "Electrical Machinery Regulations," Clause 6(3) "Electrical Control Gear", which states:

"The user shall, whenever reasonably practicable, provide switchgear with an interlocking device so arranged that the door or cover of the switch cannot be opened unless the switch is in the "off" position and cannot be switched on unless the door or cover is locked".

4.2.5 Interlocking

Further to Clause above entitled "Switchboard Preferred Tier Arrangement/Layouts", the following electrical interlocking example, with 2 x Incomers and 1 x Generator, depicts the preferred arrangement to avoid paralleling of equipment:

SWITCH	A	B	C	D
Incomer Transformer No 1	Closed	Closed	Open	Open
Bus-Section No 1	Open	Closed	Closed	Closed
Incomer Standby Generator	Open	Open	Open	Closed
Bus-Section No 2	Open	Closed	Closed	Closed
Incomer Transformer No 2	Closed	Open	Closed	Open

Note this arrangement shall preferably be electrically implemented via a PLC or mechanically via the use of keys.

However, should the electrical option be implemented, each circuit breaker shall be fitted with a separate lock out key. The preferred systems for key locking equipment shall be Keyguard, Ronis or Key master (Allen Bradley) or equivalent and approved Key Interlocking systems.

These combinations will provide the following, and only the following, arrangements:

- A Busbar 1 fed from Transformer No 1; Busbar 2 fed from Transformer No 2
- B All busbars fed from Transformer No 1
- C All busbars fed from Transformer No 2
- D All busbars fed from Standby Generator

Refer to project specification for specific details as to circuit breakers being motorized or not.
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4.2.6 Fabrication

All electrical motor control centres (MCC's), distribution boards (DB's), sub-distribution boards (SDB's), boxes, trays, covers or any other enclosure housing electrical apparatus supplied, shall be fabricated from AISI SX 3CR12 sheet steel only unless stated to the contrary.

The tenderer/contractor/manufacture shall take cognisance that MCC's and DB's shall in their entirety be manufactured from 3CR12 sheet steel. This shall include all framework used to form the structure of the panel. Angle iron or tubular structures shall not be permissible. Outer panels, doors, covers, rails, distribution board framework etc. shall be manufactured from 2mm thick 3CR12 sheet metal and 1.6mm thick 3CR12 sheet metal for internal partitions.

The sheet steel shall be suitably bent, braced and welded where necessary to form a rigid structure (this sheet metal shall be 3CR12 only). Holes, doors, covers, rails, framework, etc. shall be accurately formed to present a true to line and plumb structure when completed. Where welding is necessary the inevitable excess material shall be ground down to the parent surfaces to present a blemish free surface for painting.

All screws employed in the manufacture of the electrical cubicles shall be in AISI 316 material with machine threads. No self-threading screws or self-setting rivets (pop rivets) will be permitted. Where the thickness of material for screw tapping is less than 5 x screw pitch, an externally knurled, threaded insert shall be installed to accept the machine screw. The insert shall be fitted with a hydraulically operated tool, and properly clinched, to ensure it will not rotate in the sheet steel, even when subjected to a torque of 200% of the torque required to shear the fitted screw. The inserts shall also be manufactured from AISI 316 stainless steel.

Alternative methods of providing suitable screw anchorages in sheet steel may be considered, such as captured or welded nuts, but the detailed alternatives shall be submitted for consideration at the time of tendering.

Each tier shall be divided into compartments to accommodate equipment for motor drives, instrumentation, and switch gear for main and sub-main feeder switches.

Each compartment of MCC's or larger DB's shall be totally separated from adjacent compartments with 1.6mm sheet steel (3CR12) barriers welded or bolted into position and where wiring is required to pass through these barriers, brass brushed holed shall be provided.

Panel tiers to be bolted together and not welded.

Accessible PVC wire ways shall be provided to afford routes for conductors between the various compartments of each switchboard/MCC. Internal wiring shall be kept separated from external wiring and as far as possible the internal serving of PVC SWA PVC cables entering the switchboard/MCC shall be left around the conductors until the cable enters the compartment to which it is to be connected.

Low current and instrumentation/signal cables shall be kept separate from other cables right up to the point where the conductors are connected to the required terminals on the apparatus. Accordingly, where required, separate sheet steel (3CR12) wire ways shall be provided in each board to ensure this separation.

All instrumentation and signal cabling shall be routed via galvanised conduit within the MCC.

4.2.7 Busbars and Busbar Chambers

Totally enclosed busbar chambers shall be provided though out the length of the MCC or DB.

The busbar chamber shall have front, back, top and end covers.

The front and back covers shall be secured with square hatch keys, with one catch per cover lockable by padlock. The top and end covers shall be bolted.

The busbar chambers shall be so positioned in the MCC or DB at the top that each connection is easily accessible, and enough space is provided to easily operate a torque wrench on each bolt/nut.

Dielectric barriers shall be provided in the busbar chamber at 2 x tier module. The dielectric may not be split and offered into position as separate parts but shall instead be slotted to allow the busbars to pass through. The slotted holes shall be fitted with U-shaped rubber gasketing to ensure the busbar is snugly fitted to the dielectric. These dielectric barriers may not be employed to support the busbars. The dielectric shall be bolted to the sheet metal at the periphery of the busbar Chamber.

The penetrations for circuit into or out of the busbar chamber shall also be provided with dielectric material at the point of penetration, as for the busbar chamber barriers.

Busbar supports shall comprise moulded epoxy insulators mounted on robust steel brackets arranged in stepped formation with the red-phase busbar at the top rear of the chamber and the neutral busbar at lower front position.

All busbars shall be tinned over the full length using only resin-based flux and fitted with phase colour co-ordinated identification markings.

Joints in busbars shall be avoided as far as possible, but where they are necessary the joint shall be formed by offsetting one of the bars, by an amount equal to its own thickness, to overlap the other. The length shall be equal to twice the width of the bar, and the joint shall be secured with a minimum of 4 Hexagon headed set screws nuts and washers (plain and spring).

All busbar joints shall be torque tightened before the switchboard (MCC or larger DB) is delivered, and torque checked (and tightened if necessary) just prior to commissioning.

Each joint or point of connection shall be properly tinned. Only resin-based fluxes shall be employed during the tinning process.

The busbar riser sections, onto which cables terminate, shall be considered as part of busbar system and shall be equally subject to all the specifications detailed.

Busbars shall be capable of carrying the full rated current along their entire lengths. Reduced section busbars will not be permitted. Busbars shall be designed for a maximum temperature of 70°C (i.e. a 40°C temperature rise in an ambient of 30°C). Where a transformer feeds directly to the busbar (via a main circuit breaker), the copper busbar shall be designed for 125% of the transformer output (in kVA) and shall be rated to withstand an internal or external fault for 3 seconds without incurring any damage.

The neutral busbar in the MCC or any DB shall be equal in size to the busbars and shall be considered as part of the busbar system.

Busbars shall be manufactured from 99% electrolytic copper that has been hard drawn to the finished sizes. The copper shall be rectangular in cross section, shall be solid, and the cross section shall be maintained throughout the busbar system. Where the copper is delivered with rounded corners the copper shall be suitably de-rated for thermal emissivity. The copper shall be supported on SANS approved insulators at centres which are commensurate with the fault level to which the busbar system has been designed, but in no instance shall they be greater than 500mm apart. Where it becomes necessary to employ more than 1 copper bar per phase the copper bars shall be of equal cross section and shall be properly spaced by an equal thickness spacer between the copper bars. Only copper having a cross section of 100mm x 6mm, or greater, may be employed in parallel, per phase.

The spacers shall be bolted into position at points of attachment for lugged conductors or droppers. Where joints in the copper bar are inevitable, they shall be made by offsetting one bar by the thickness of the copper such that the copper bars overlap one another, at the joint, by the width of the copper. Joints shall be properly fastened together with hexagon headed bolts, full size nuts, spring and flat washers. At least 2 and not more than 3 threads shall be visible beyond the nut once the final torque has been applied to each fastener. Where copper is punched or drilled the inevitable burr shall be removed and the copper shall be lightly chamfered at each hole.

The busbars shall be provided with holes at either end of the switchboard to allow for an extension to the copper bar at some future time, together with centrally located holes in the copper bars, between the insulating supports to allow for future loads to be added where required. At least two such sets of holes shall be provided, between consecutive supports along the busbar length. If more than one copper bar per phase is being employed, then a copper spacer shall be provided between the copper bars and a bolt shall be provided to secure the spacer at each of the "spare hole" positions. All copper shall be tinned with S6 solder using resin-based flux, after all the drilling, bending and cutting has been completed. The finished, tinned copper shall be free of solder lumps and shall be as smooth as the copper under the solder.

4.2.8 Wiring, Cable Terminations and Glanding

All wiring within panels may be enclosed in PVC slotted ducting. The exception is signal and instrumentation cabling passing through power compartments or cubicles, which shall be in galvanised screwed conduit. Wiring outside of panels and switchboards shall be run within galvanised ducting or conduit.

Alternatively, signal and instrumentation wiring may be run in a channel at either the front or the rear of the busbar chamber, accessible from that respective side of the switchboard within the busbar chamber. The channel shall be manufactured of 3CR12 and shall be welded into position. The channel shall contain a cover that is screwed into position.

All wiring and terminations shall be labelled with identification tags corresponding to the wiring diagrams. Cable terminations shall be marked with an identification label externally to the switchboard indicating the source of supply as well as the equipment being fed for feeder cables. For example: "FED FROM MCC 1" and "SUPPLY TO SUMP PUMP".

All glands for cable shall be nickel-plated brass and fitted with waterproof neoprene shrouds.

4.2.9 Earth Bars

The earth bar shall be mounted at the rear of the MCC or DB and shall be accessible along its length from all tiers (where applicable). The earth bar cross-section shall be as specified, or, where not specified, shall be installed as per the minimum specified in SANS 10142-1 or SANS IEC 60439. Notwithstanding these requirements, the earth bar shall be not less than 70mm x 8mm in cross-section.

A one-piece copper earthing bar shall be installed from one end of the board to the other and shall be provided with earthing studs (nuts, bolts and washers) in each tier

The copper bar shall be bolted to the framework of the board in at least 10 positions with 10mm bolts. The copper bar shall be mounted 100mm above the top edge of the channel iron base and approximately 100mm from the backplate. Holes shall be provided in the copper bar in each cubicle along the length, for the termination of the earthing conductors associated with the circuits deriving a supply from the respective cubicles. Spare studs amounting to 10% of the Contractors requirements, shall also be provided. Bunching of earthing conductors on a single stud will not be permitted.

4.2.10 MCC and DB Bases

The floor mounted MCC or DB, shall be mounted to a hot dipped galvanised channel iron base, located at the position indicated in the transformer room. The base shall be fabricated

from 100 mm x 50 mm x 6 mm (10,57 kg/m) channel iron. The corners of the base shall be mitred and welded whilst cross bracing shall be provided on centres coincident with the cubicle modules along the length of the base.

Each cubicle shall be secured to the base with at least four 10 mm diameter bolts, washers and nuts whilst the base shall be anchored to the concrete with a bolt in each corner and two bolts at every even numbered cubicle module. (One at the front of the base and one at the rear). The anchor bolts shall be 12 mm diameter and shall be entered at least 80 mm into the concrete.

The widths shall be uniform throughout their heights and the plan view of the switchboard shall be uniformly rectangular.

4.2.11 Paint and Finishing

All metalwork more than 5 mm thick shall be sandblasted to a profile of 40-80 microns, prior to painting. This finish shall be carried out carefully to provide the necessary "key" for the paint coats.

Where the material is less than 5 mm thick, it shall be, lightly sanded, de-greased, washed and forced air dried prior to painting.

The paint coat shall be a high-quality polyurethane-based powder coat to the acceptance of the Engineer. The sprayed powder coat shall be baked in an oven at a temperature of approximately 200°C for a period of 10 min or as specified by the paint manufacturers.

The dry film coat shall be as uniform as possible but shall not be less than 40 microns nor more than 90 microns. The finish shall be high gloss with a minimum of surface defects.

Distribution boards, boxes, trays, covers, ducts, or any other enclosure housing electrical apparatus shall be coloured **White** internally, whilst externally the colour shall be **Light Orange** to SANS 1091 or to the approval of the Engineer.

Switchboards connected for dedicated emergency supplies shall be coloured **RED** externally.

4.2.12 Glandung Sections and Cable Gland Plates

Gland plates shall be fitted in cubicles for termination of cables and shall be mounted 400mm above the final floor level. The cables shall be fitted with glands anchored to the respective gland plates. The glands shall be adequately spaced to permit the locknuts to be tightened with normal tools.

The gland plates shall be at least 2mm thick, 3CR12 sheet steel or aluminium and shall be bolted to robust brackets welded to the framework of the board.

At positions where single core cables are employed the cable gland shall be fabricated from non-ferrous material of adequate thickness to support the cables i.e. 15mm thick TUFNOL, 5mm 316 stainless steel or 8mm aluminium.

4.2.13 Doors and Covers

A door shall enclose the front of each compartment, unless stated otherwise in the project specification.

Enclosures for outdoor or moist environments shall be provided with a weather lip angled at 45° to the face of the enclosure framework, together with a door enclosing the cubicle and enveloping the weather lip. The top of the outdoor enclosure shall be fitted with a full width canopy projecting at least 100 mm from the enclosure face.

All doors shall be arranged to stand off from the face/rear of the board, cubicle, compartment or enclosure. Each door shall be properly stiffened and shall be twice returned at the periphery. The second return shall be gusseted in the corners to further brace the door.

Large doors (e.g., those fitted to the rear of individual switchboard/MCC tiers) shall be further stiffened with "top hat" section channels welded to the inside of the door.

Each door shall be mounted on pin type hinges and shall be secured by means of a lever operated tapered tongue catch or catches (Hinges and catches shall be Barker Nelson or equal to approval). The lever shall be provided with an external stop to prevent rotation more than 360° and to provide a padlocking facility. (A hole in the stop and a hole in the lever).

A minimum of two square hatch keys catches are required per door or rear panel, installed in conjunction with the tapered tongue catch at the top and bottom edges of the door on the opposite side of the hinges. For rear panels, one or both square hatch key catches shall be padlock able by having an extended section that encloses the latching mechanism and will allow a standard lock to prevent operation of the catch while in place.

For covers over busbar chambers, four square hatch key catches are required, with a minimum of one catch required to be lockable.

Where doors are mounted adjacent to one another the spacing shall be arranged to permit each door to open through at least 150°, without fouling the adjacent door. A stop shall be provided which shall prevent the door from opening further to obviate damage to paintwork.

Doors fitted with flush mounted equipment shall be properly braced and stiffened to support the equipment. The hinges shall be easily able to support the mass added to the door when the flush fitted equipment is installed.
The space between the back of the door and the face of the cover plate shall be nominally 80mm.

Where cover plates are provided behind the doors, the cover plates shall be adequately recessed into the cubicle to permit the spindle on the lever to drive the tapered tongue catch into a slot in the framework of the board without fouling the cover plate.

Cover plates shall be fabricated as for the doors and shall be further stiffened to compensate for the machine punches circuit breaker slots. The cover plates shall be secured at the top edge with at least two square key driven catches, whilst at the lower edge they shall be located with two 6mm diameter tapered dowel pins located in holes drilled in the architrave. Each pin shall be fitted with a 1.2mm thick spacer washer. Both the pins and the washers shall be welded to the cover.

The end, rear and top cover plates shall be removable to permit access to the equipment. The cover plates shall be lockable in the closed positions.

4.2.14 Space Requirements

In arranging the chassis layouts, a minimum clearance of 80mm between equipment and framework, side panels or internal divisions is required. This minimum space is required on the top, bottom and sides of equipment.

A minimum of 50 mm is required between equipment and wire trunkings. The spacing between equipment shall be enough to allow for the installation of conductors (taking in account the minimum permitted bending radii of conductors and cables).

A minimum of 80mm is required between power equipment (circuit breakers, contactors, etc.) and any auxiliary control devices.

4.2.15 General Mounting Requirements

No special tools shall be required to remove and re-install any equipment.

4.2.16 Switchboard Standard Colours

The following colours shall be utilised for electrical switchboards as SANS 1091:2012:

11kV to 400V Mains Supply	– EXTERNAL	:	B26 (Light Orange)
400V Mains Supply	– INTERNAL	:	INTERNAL: G80 (Cloud White)
Emergency Supply	– EXTERNAL	:	A11 (Signal Red)
Uninterruptable Power supply	– EXTERNAL	:	F01 (Royal Blue)

4.2.17 Metering within Switchboards

A combined Maximum Demand and kWh meter shall be provided, with associated cabling, fuses, current transformer, calibration certificates etc. in the metering cubicle situated above the bus-section switch for the metering of the incomer supply from the Local Supply Authority and the incomer from the future Generator.

The meters shall be positioned behind a glass panel cut into the metering cubicle and shall only be accessible once the cubicle door has been opened. A small diameter hole shall be drilled through this glass to allow the meter function selector switch to be depressed without having to open the metering cubicle door.

This metering shall be independent of the metering to be supplied by the Local Supply Authority for billing purposes.

The meters shall be of the “Landys and Gyr” type or equal approved.

4.2.18 Field Control Stations

These constitute local control stations mounted adjacent to equipment such as instrumentation, motors, etc., or emergency stop stations in proximity to rotating machinery.

Where required, these field control stations shall be installed in Glass Reinforced Polyester enclosures mounted on a hot dip galvanised stand. The stand shall be constructed of a minimum of 100 mm x 50 mm U-channel, 3 mm thick, welded to at least a 300 mm x 300 mm x 3 mm thick base, bolted to the floor at each of the four corners.

A 3CR12 hood shall be fitted over the GRP enclosure.

4.2.19 Switchboard Construction Drawings – Standard Requirements

All Construction Drawings for switchboards (MCCs, DBs, Field Control Stations and Instrumentation Panels etc.) shall contain the following information:

- Project Name and Contract Number
- Manufacturer/Supplier
- Consulting Engineer and contact person
- Client details
- Drawing Number and Revision
- Drawing to be Signed
- Source of Supply – MCC or transformer name etc.
- Switchboard General Description
- Fault level (kA and time rating)
- Form factor/Sectioning
- Busbar Details (cross-section, material type, tinned etc.)
- Busbar Support Details – type, manufacturer
- Earth bar details (cross-section, full-length, front or rear etc.)
- Switchboard Material type, grade, thickness etc.
- Gland Plate details – material type, thickness, mounting etc.
- Colour – internal and external
- Switchboard Dimensions
- Base Dimensions and bolting arrangements

- Front door details – hinge and padlock requirements
- Rear door details – hinge and padlock requirements
- End panel details – removable cover details
- Door details - Stiffeners and retainers installed etc.
- Hinge Details
- Locking Details
- Handle Details
- Cable Entry Details
- All bolts, nuts, screws material type (i.e. 316 Stainless Steel)
- Equipment details – CB ratings, fault levels, type, manufacturer etc.
- Equipment Layout details – Cubicle name, function, equipment function etc.
- Indication Light colours
- Section to be provided through switchboard

4.2.20 Switchboard Schematic – Standard Requirements

All Schematic Drawings for switchboards (MCC's, DB's, Field Control Stations, Instrumentation Panels etc.) shall contain the following information:

- Project Name and Contract Number
- Manufacturer/Supplier
- Consulting Engineer and contact person
- Client details
- Drawing Number and Revision
- Revision details to be listed
- Drawing Page Number
- Drawing to be Signed
- Reference Grid required on each schematic page
- Source of Supply – MCC or transformer name etc.
- Fault level (kA and time rating)
- Voltages for all circuit to be clearly indicated
- All devices to have reference number i.e. relays
- Equipment ratings to be given i.e. motor ratings
- All indication lamps to be labelled including required lamp colour
- Legend to be provided
- Equipment Tag Numbers as per P&ID and Water Services Plant Numbering System to be provided

5. SWITCHGEAR AND CONTROL EQUIPMENT FOR SWITCHBOARDS

5.1 GENERAL

All equipment shall be of sizes, ratings and specification as detailed and as shown on the Single Line Diagrams. Where feeders or cables must be revised because of equipment selection by the Principal Mechanical Contractor, these shall be done after the award of the Tender.

All equipment shall be approved by the Engineer in writing before acceptance for use on the project and shall bear the SANS mark.

5.2 CIRCUIT BREAKERS

The circuit breakers shall comply with SANS 156 and VC 8036.

Cascading of circuit breakers is not permitted unless specified in the detailed Project Specification.

All equipment shall be of sizes, ratings, and specification as detailed in on the single line diagrams. All equipment shall be approved by the Employer in writing and shall bear the SANS mark.

Where cascading of circuit breakers is allowed, all equipment shall be coordinated, and discrimination shall be considered.

Circuit breakers shall preferably be from the same supplier in one application.

Circuit breakers shall be equipped with an instantaneous magnetic release and a thermal release. Circuit breakers for motor circuits shall be suitably rated.

Circuit breakers handles shall provide a clear indication of "ON", "OFF" and "TRIP" status.

Circuit breakers shall be installed vertically with the upstream terminal on top. Minimum clearances shall be maintained.

All circuit breakers shall be pad lockable in the "off" position or be supplied with means that will enable pad locking.

Circuit breakers shall be supplied and fitted with all supplementary equipment e.g., shrouds, mounting bolts, clips, adaptor plates etc.

5.3 METAL CLAD AIR CIRCUIT BREAKERS (ACB'S)

Metal clad air circuit breakers shall be of the withdrawable type and shall be suitable for use in power distribution systems up to 1000V 50Hz. The circuit breakers shall comply with latest SANS Standard and shall have a P2 performance rating.

The ACB's shall be self-contained units of the dead front type with the necessary mechanical interlocks to prevent: -

- Access to "Live" terminals when the circuit breaker is withdrawn.
- The withdrawal or insertion of the ACB when the circuit breaker is in the closed position.
- Closing of the circuit breaker without resetting after an automatic trip.

The circuit breaker shall be of the quick make and quick break type with a stored-energy spring assisted operating mechanism provided with: -

- A trip free, mechanical, hand operated closing mechanism.
- A manually operated, mechanical, trip mechanism suitably protected to prevent inadvertent tripping.
- A positively driven mechanical device to provide ON – OFF. - TRIP indication.

All non-current carrying metal parts of the ACB shall be connected to the earthing contact on the truck of the switch, which shall engage with a mating contact on the cradle. The cradle itself shall be connected to the earthing bar in the switchboard. The contacts for the earthing shall be made in the "Racked In" position as well as in the "Test" position. The cradle shall be of robust construction and shall incorporate safety shutters. The "RACKED IN", "TEST" and "RACKED OUT" positions shall be clearly marked and easily visible.

The ACB's shall be designed in such a way that the direction of the energy flow does not affect the operation or performance of the breaker.

Adjustable thermal overload releases shall be provided to suit the required current range. In addition, a magnetic short circuit release shall be fitted. This release shall have an adjustable current release value as well as an adjustable time lag. A minimum of four, time lag settings shall be available.

Care shall be taken to ensure the magnetic release occurs at a sufficiently low value to

afford full protection under the lowest fault current conditions. (Where generators are encountered).

Each ACB shall be equipped with the following accessories: -

- Two normally open auxiliary contacts.
- Two normally closed auxiliary contacts.
- One alarm contact.
- One shunt release.
- Padlocking facilities in the "OFF" and "TEST" positions.
- Key interlock.

Each ACB shall allow for the fitting of the following options: -

- Motor drive for spring charge mechanism.
- Closing release complete with "Anti Pumping Circuit"
- Adjustable time delayed undervoltage release.
- Carriage switches for "RACKED IN" and "TEST" positions.
- Mechanical interlock facility of the Bowden type.

Minimum clearances and distances between the enclosure and the arc chutes shall be strictly observed.

Full technical information of the ACB's offered, shall be supplied with the Tender.

5.4 MOULDED CASE CIRCUIT BREAKERS (MCB'S)

Moulded case circuit breakers shall be suitable for use in 1000V distribution systems at 50Hz. The circuit breakers shall comply with SANS 156:2007 and VC 8036.

CCB's of the same frame size and the same fault level shall be from the same manufacturer.

Circuit breakers for feeders to lighting and small power sub-distribution boards and motors shall be equipped with an instantaneous magnetic release and a thermal release.

Discrimination shall be provided in the feeder circuit breaker arrangement. An adjustable release shall be provided where deemed necessary.

MCCB's employed for motor-starting circuits shall be rated in such a manner as to avoid 'nuisance tripping'.

Feeder breakers to motor control centres shall be equipped with a thermal release and a time and value adjustable release. These MCCB's shall be selective towards the upstream and downstream circuit breakers. MCCB's of the same frame size, where in one application an instantaneous magnetic release is employed and in another application a time lagged release is used, shall have plug-in type trip units. The operating handles of the MCCB's shall provide a positive "ON" "TRIP" "OFF" indication of the breaker status.

MCCB's shall be installed vertically. Horizontal mounting will not be accepted. Minimum clearances and distances between the enclosure and the arc chutes shall be strictly observed.

6. MOTOR STARTING AND DRIVE SYSTEMS

6.1 GENERAL

Motor starter, and in general all starter panels, shall be as per spec.

Direct-on-line motor starter contactors shall be equipped with three pole thermal overload relays according to the rating of the motor. This shall be a combination unit with the door-Interlocked circuit breaker. The thermal overload relay shall be provided for single-phase protection; it shall be equipped with an electrical/electronic reset facility.

Drives to high gear ratio motor (such as the screen drive, screw conveyor and compactor)

shall be equipped with an electronic shear-pin device. This protection relay will disregard the motor starting current, but trip the drive, should the current rise above a set threshold during running. Should a phase failure or imbalance relay be incorporated in the design, this trip mechanism shall be manually reset along with the thermal overload relay.

6.2 DOL MOTOR STARTER COMPARTMENTS

Motor starter compartment shall include for a minimum of: -

- i. Circuit-breaker (back plate mounted and arranged vertically).
- ii. Mechanical operating handle for circuit-breaker, including door interlock, self-aligning spindle and padlocking facility (door mounted).
- iii. Current transformer class 1,5 (backplate mounted).
- iv. Ammeter.
- v. Run Hour meter.
- vi. Contactors for DOL starting or contactors for alternative methods of starting (backplate mounted).
- vii. Thermal overload device operating on single phase / three phases (usually mounted on contactor).
- viii. Electrical/electronic reset push button for thermal overload (via door mounted pushbutton
- ix. Selector switches MAN, OFF, AUTO (door mounted).
- x. Stop / emergency stop push buttons (door mounted).
- xi. Start push button (door mounted).
- xii. Relays for stop: start and other controls where required (back plate mounted).
- xiii. Pilot lights for:
 - ◆ motor stopped but power available (red)
 - ◆ motor running (green)
 - ◆ motor tripped (amber)
- xiv. Din rail mounted terminals.
- xv. Lamp Test (black push button)
- xvi. Submersible motor application

6.3 VARIABLE FREQUENCY DRIVES

The variable frequency converters (motor starter/controller) shall be capable of driving a motor to its full, rated, nameplate output, at frequencies as specified, for an indefinite period. Short time ratings may not be considered.

(a) Technical requirements for variable frequency converter

The variable frequency converter shall be designed to the following technical requirements:

Type:	The controller shall be of the dc link pulse width modulated type
Engineer.	and shall be fully digital, to the approval of the
Operation:	Speed control through frequency variation with minimal losses. The
set	desired operating speed shall be a measure of the frequency point.

Constant flux shall be supplied over the entire speed range. The inverter shall be the final controlling element for the converter voltage and frequency, in accordance with pre-set selections.

The modulated output voltage shall ensure smooth running of the motor with minimal losses and noise down to the minimum speed.

Line frequency:	50 Hz \pm 2,5 %
Power switching: transistors.	Power switching elements shall be Insulated Gate Bi-polar
Efficiency:	Shall exceed 96 %.
Overload factor:	120 % for 50 s
Load side voltage:	400 V
Approved manufacturers:	Allen Bradley, Mitsubishi, Fuji, ABB
Indication:	The following indication shall be provided and mounted on the VSD door or behind a suitable window in the door. <ul style="list-style-type: none">▪ Ammeter (measuring motor current)▪ Motor Speed (in r/min)▪ Running Hour meter (motor running hours)▪ Motor running indicator lamp (LED) (Green)▪ Fault indicating lamp (LED) (Amber)▪ Starter healthy indicating lamp (LED) (Red)

(b) Selection functions and facilities of variable frequency converter

The selection of functions and the setting of parameters shall be accomplished using menu driven software and a control pad.

The control pad shall be a membrane covered keypad with LED display unit and shall be mounted on the front door of the enclosure and cabled to the converter.

The control pad shall be lockable and shall not be available to the operator for normal operations. The LED display shall, however, be visible.

The converter shall be capable of providing the following minimum control functions:

Skip frequencies: -	A minimum of three programmable skip frequency ranges
Auto restarts: -	A programmable number of restarts with a programmable delay.
Ramp functions:	Individually programmable start up and slow down ramp functions.
Running hour meter:	The variable speed controller shall give the total running time for the connected motor.
Communication:	RS 485 (capable of communicating over a 10 m length of interface cable)

Analog control inputs:	Remote speed reference (0-10 V).
Local speed	Thermistor (motor) (0-10 V).
Digital control inputs	External trip, Local start/stop, Auto; Off; Manual switch, Fault Reset
Control outputs:	Fault relay Run relay Low speed relay Motor current (0-20 mA and/or 0-10 V) Motor frequency (0-20 mA and/or 0-10 V)
Protection:	Thermal Current limit Instantaneous over current trip Individual drive protection Earth fault detection Phase imbalance detection or loss of output phase or phases.
Frequency:	Adjustable in the range 2 000 Hz to 5 000 Hz.
Range of Speed Adjustment:	0 - 70 Hz
Start/Emergency stop:	Start/Emergency stop push buttons shall be mounted on the front door of the respective enclosure and wired accordingly.
Auto, Off, Manual:	an Auto, Off, Manual switch shall be provided on the front door of the cubicle and wired accordingly.
Manual Speed Control:	A potentiometer shall be provided inside the enclosure.
The variable frequency converter shall incorporate simple controls for adjusting the ramp-up time and regulating the starting current.	
The Contractor shall wire the following variable frequency converter status signals back to the Telemetry cubicle:	
i.	Motor running and / or motor tripped,
ii.	Flow rate of pump,
iii.	Power failure conditions.

7. WIRING, CABLE TERMINATIONS AND GLANDING

- All wiring within panels may be enclosed in PVC slotted ducting.
- The exception is signal and instrumentation cabling passing through power compartments or cubicles, which shall be in galvanised screwed conduit.
- Wiring outside of panels and switchboards shall be run within galvanised ducting or conduit.
- All wiring and terminations shall be labelled with identification tags corresponding to the wiring diagrams. Cable terminations shall be marked with an identification label externally to the switchboard indicating the source of supply as well as the equipment

being fed for feeder cables or example: “FED FROM MCC 1” and “SUPPLY TO SUMP PUMP”.

8. STANDARD COLOURS – INDICATION LAMPS AND BUTTONS

The suitability of colours employed is generally based on IEC 60073 (No SANS version/ To be updated with latest Standard).

Due to colour schemes on existing plant and user/operator familiarity, the application of certain colours differs from IEC 60073 (To be updated with latest standard). For clarification, the lamp colours reflect the status of the control system (front of panel towards equipment to be controlled).

The following colours shall in general be employed on switchboards for indication lamps, push buttons and selector switches:

COLOUR	Condition / Meaning / Application
RED	System stopped/not running or CLOSED
AMBER/YELLOW/ORANGE	Any warning/trip/abnormal condition
GREEN	System running/healthy/normal/ SAFE Condition or OPEN
BLUE	Step/Process change condition
WHITE	Mode indication or other indication (where doubt exists about applicability of Red, Yellow or Green)

Specifically, the application of colours shall be as follows:

INDICATION LAMP COLOURS			Examples/Specifics
Local/Auto/SCADA Mode	Indication Lamp	WHITE	
Bus Bar Alive	Indication Lamp	WHITE	
Capacitor Bank Discharged	Indication Lamp	GREEN	Power Factor Equipment
Closed	Indication Lamp	RED	Valves, penstocks
Differential Pressure – HIGH	Indication Lamp	AMBER	
Differential Pressure – NORMAL	Indication Lamp	GREEN	
Earth Fault	Indication Lamp	AMBER	MV Equipment
Emergency Stop	Indication Lamp	AMBER	
Mechanical Seal Failure Warning	Indication Lamp	AMBER	Sub / Immersible Pumps
Moisture in Coolant	Indication Lamp	AMBER	Sub / Immersible Pumps
Moisture/Water Ingress	Indication Lamp	AMBER	
Motor Winding Over Temperature	Indication Lamp	AMBER	May be flashing AMBER
Open	Indication Lamp	GREEN	Valves
Overload	Indication Lamp	AMBER	
PFC Fault	Indication Lamp	AMBER	Power Factor Equipment
Running	Indication Lamp	GREEN	
Starter Alive (Circuit Healthy)	Indication Lamp	GREEN	
Stepped Function	Indication Lamp	BLUE	Power Factor Equipment
Stopped & Power Available	Indication Lamp	RED	
Tripped	Indication Lamp	AMBER	
PUSH BUTTON/SELECTOR SWITCH COLOURS			Examples/Specifics
Emergency Stop	Push Button	RED	With yellow backing
Lamp Test	Push Button	BLACK	
Reset	Push Button	BLUE	
Start	Push Button	GREEN	
Stop	Push Button	RED	
Up/Down/Left/Right/Forward/Reverse	Push Button	BLACK on WHITE	
Selector Switches/Knobs			BLACK with Black back plates with white lettering

9. SWITCHBOARD ACCESSORIES

9.1 GENERAL

Refer to the switchboard equipment schedule in the Project Specification as well as the proposed Motor Control Centre in the Project Specification for additional details.

All manufacturers / suppliers of switchboard accessories shall ensure that the equipment is SANS certified. All systems providing starting and control shall provide full protection from the effects of internal and external faults.

9.2 INSTRUMENTATION IN GENERAL

Instruments shall generally be designed for an accuracy of 1% (Class 1) of the full-scale reading. (Assume the frequency remains constant at 50 Hz).

Instrument faces shall be either 96mm x 96mm on large panels or 76mm x 76mm on smaller panels.

The faceplates shall be painted white with black paint for the lettering and scale divisions. A thumbnail operated adjuster shall be provided to zero the pointer at any given time. A clear glass window that is positively located by the framework of the instrument shall enclose the pointer and faceplate.

The glass shall be mounted on a gasket that will seal the space between the faceplate and the inside surface of the glass against the ingress of moisture and dust.

Terminals shall comprise nuts on a moulded in stud at the rear of the instrument. The terminals shall be fitted with two washers and a colour coded rubber shroud. The shroud shall allow the wire, fitted with a lug, to approach the stud at 90° and shall be moulded accordingly.

Instruments shall be provided with a scale not less than 20% above the normal operating value of the function being measured, then rounded up to the nearest standard scale provided by the manufacturers.

9.3 VOLTMETERS

Volt meters shall be of two sizes 96mm x 96mm on the large panels and 72mm x 72mm on the smaller panels. The meters shall be of the moving iron type and the movements shall be mounted on shockproof suspensions. The accuracy shall meet class 1.5 i.e., 1,5% of full-scale value at each reading.

The main incoming section of the Switchboards (Motor Control Centres in particular) shall have a Voltmeter of 96 mm x 96 mm size, equipped with coloured surrounds representing each phase, i.e., Red, White and Blue and equipped with a phase selector switch. The switch shall permit the indication of all phase to phase and phase to neutral voltages on the voltmeter. The phases shall be noted as "R", "W" and "B".

Where a voltmeter is connected to the main busbar and a selector switch is provided for the operator to monitor the voltage between any two phases or between any phase and neutral, then two sets of HRC fuses shall be provided. One set mounted on the respective phase bars and the second set mounted adjacent to the voltmeter on the back of the door. The fuses mounted on the cover plate shall each be provided with an element that affords protection for the conductors run between the two sets of fuses. The second set of fuses shall be fitted with elements that afford protection for the selector switch and instrument, besides being a convenient (and safer) point of disconnection for the maintenance staff. The minimum wire size for a voltmeter circuit shall be 2,5mm².

9.4 AMMETERS

9.4.1 Digital Indicators

- Indicators shall conform to the following: Digital with relay outputs
- Microprocessor based
- LED display
- Measurements 96mm x 48mm
- Unit must be **pluggable**

Inputs:

Process signals

Basic specifications: -

Power Supply	115V 50/60Hz 230V 50/60Hz 24V 50/60Hz 24VDC Isolated
Power consumption	3~6VA

Display reading	User programmable from -999 to +999
Input	Thermocouple J, K, N, R, S, T, Pt100 0/4~20mA, 0/1~5V 0/2~10V, 0~1mA AC Volts true RMS AC Amps true RMS
Accuracy	±0,25% of span ± 1 digit
Repeatability	±0,2% of span ± 1 digit
Operating temperature	-5 to +65°C
Operating Humidity	0 to 95% RH Non-Condensing
Relays-SPDT	AC 5A 250V 1250VA DC 5A 30VDC

Ammeters shall be of two sizes 96mm x 96mm on the large panels and 72mm x 72mm on the smaller panels.

The meters shall be of the moving iron type and the movements shall be mounted on shockproof suspensions.

The accuracy shall meet class 1.5 i.e. 1,5% of full-scale value at each reading.

The main incoming section of the Switchboards (Motor Control Centres in particular) shall be equipped with instantaneous and maximum demand ammeters of 96 mm x 96 mm size, equipped with coloured surrounds representing each phase, i.e. Red, White and Blue.

Each individual starter/drive cubicle shall be equipped with a 76 mm x 76 mm logarithmic scale instantaneous ammeter, with a label above the ammeter indicating the full load current for the respective drive.

Ammeters for ac applications shall be of the type suited to motor drives and shall provide a substantive over-range to allow for the motor starting current. The faceplate shall be marked, with a red line, at the point on the scale where the absorbed motor current occurs.

Ammeters shall be arranged in circuit for direct reading or indirect reading (CT operated), as

required. Direct reading devices shall be employed up to a maximum of 40 A. Where multiple CT's are installed to permit a single instrument to indicate the load on each phase, in sequence, a rotary selector switch shall be provided which will permit the operator to select the phase he wishes to monitor.

The CTs shall be connected in a star configuration and the star point shall be directly connected to the main earthing bar in the MCC. The minimum wire size for a CT and Ammeter circuit shall be 2,5mm².

9.5 RUN-HOUR METER (RHM)

Run-hour meters in general shall be 72mm x 72mm in size and shall be installed for all motor starting and controlling applications. Run-hour meters shall be mounted on access doors with the face of the meter visible from the front of the board.

Run-hour meters shall be suitable for 230V 50Hz applications and arranged to operate directly from the control voltage but shall be controlled by the motor starter. The dial shall be cyclic and shall count to 99999,9 before returning to 0. A reset facility is not required.

Run-Hour meters shall however be the same physical size as the Ammeter on the same panel. Enlarged bezels that make the run-hour meter appear the same size as the Ammeter, will not be accepted.

9.6 TIME SWITCHES

The time switches shall be of the 24-hour type, operating on a 230 V 50 Hz supply with an electrically wound 9-hour spring reserve. The time switches shall be mounted behind the hinged access doors. Each time switch shall be fitted with fifteen "on" stops and fifteen "off" stops thereby providing 30 selective operations per 24 hours.

9.7 TIMERS

The timers shall be of the electronic plug-in type operating on a 230 V 50 Hz supply. The timers shall be adjustable by turning a knob. They shall be mounted facing the front of the board but behind the access door.

9.8 FUSES

The fuses shall comply with SANS 60269-1 and SANS60269-4 and shall be adequately rated for the circuit currents. All fuses shall be positioned to be accessible.

9.9 FUSE HOLDERS

All fuse holders shall comply with the latest SANS Standards and shall be adequately rated to cater for the load currents.

9.10 SELECTOR SWITCHES

Selector switches shall be of the Top Hat rotary pattern and shall be mounted on the cubicle doors or on the door to the panel above the circuit breaker. All selector switches shall have a minimum rating of 15 A.

These shall preferably be of the same manufacturer as the push buttons and indicators lamps.

Selector switches shall allow contacts arranged in wafer housings that permit stacking

along, and positioning about, the centrally mounted spindle driven by the operating knob.

The escutcheon plate mounted on the door of the motor drive, or other, cubicle shall be secured with screws secreted from view by the 'snap on' plastic cover which shall be engraved in accordance with the circuit requirements (i.e. ON - OFF. REMOTE - OFF - LOCAL. MANUAL - OFF - AUTOMATIC) etc.

The spindle shall be splined to allow the contacts within the wafer housings to be 'timed' for early or late, make and brake contacts, as required.

9.11 RELAYS

The relays shall be general purpose plug-in relays with octal or 11 pin bases. Soldered connections to bases will not be accepted. Each relay shall be tightly sealed with a clear plastic cover. All relays shall operate on a 230 V 50 Hz supply. Preferred supplier is FINDER.

9.12 OVERLOAD RELAYS

The overload relays shall be of the thermal type with an element in each phase and shall conform to the characteristic curve held by the manufacturer with a tolerance of + 10% of the values as specified in the SANS/IEC 60947-4-1.

9.13 CONTACTORS

The contactors shall be operated electro-magnetically. The control voltage shall be 230 V, except for the dc emergency lighting contactor, which shall be 110 V dc.

Contacts shall be capable of carrying 125% of the full load circuit current continuously.

The contactors shall be suitable for "Intermittent Duty" 15 operations per hour.

9.14 CONTROL PUSHBUTTONS

In conjunction with the Clause entitled "STANDARD COLOURS – INDICATION LAMPS AND BUTTONS", the Control Pushbuttons shall be of the round, flush, spring-loaded type, 22,5 mm in diameter, coloured in accordance with the duty as follows: -

START	=	Green
STOP	=	Red
LAMP TEST	=	Black
RESET	=	Blue

9.15 INDICATING LAMPS

Indicating lamps shall comprise a cluster of four light emitting diodes arranged in a common housing.

Each lens shall be coloured as required for stop, start, alarm, trip, etc. shall be at least 20 mm diameter and shall be clearly visible through an angle of 180° in a brightly lit room (500 - 600 Lux) and the contrast between an energized condition and a de-energized condition shall be clearly visible from all sides as well as in front.

The indicators shall be suitable for use on either 230V AC / 24V DC supply as per project specification. If the LED is not able to operate direct from the control voltage called for then a separate controller shall be provided with each LED to ensure that all LED's are fully interchangeable with those adjacent or on a separate panel some distance away.

The housing shall be fitted through a hole in the door of the cubicle and shall be secured with a separate screwed ring or a bayonet plate that is tightened into position with grub screws.

The housing body shall be provided with a key to locate in a groove in the door cut-out to prevent the housing from rotating.

In conjunction with the Clause entitled "STANDARD COLOURS – INDICATION LAMPS AND BUTTONS", the lens shall be coloured in accordance with the duty as follows: -

Red	=System stopped and power available.
Green	= System running.
Amber	= System tripped.
Amber	=Water ingress detected (Submersible / Immersible machines).
White	= Busbar alive.

9.16 STOP PUSHBUTTONS

Stop push buttons shall comprise two main components namely a front mounted operator and a rear mounted contact block.

The front mounted operator shall be fitted with a cylindrical housing, which is attached and keyed to the mounting panel. The cylindrical component shall house a spring returned, flush mounted button.

The rear mounted contact block shall be arranged with a bayonet feature that attaches to the front mounted component and is secured with grub screws or a locking ring.

The push button shall actuate a silver alloy bar contact rated at not less than 15A. Conductors shall be fitted with a crimping ferrule to be secured by a screw adjusted clamping terminal mounted in the contact block.

The complete assembly when mounted and connected shall provide protection against the ingress of dust or vapours to IP66. Once access is gained to the rear of the device the Technician shall still be protected from accidental contact to IP4x.

The unit shall be maintenance free and shall provide at least 1 million operations before failure. The front mounted operator shall be coloured RED and shall be engraved with the word STOP.

The contact block shall be provided with locators and screw anchors or clips, to accommodate an additional contact block mounted "piggy back" on the first contact block.

9.17 START PUSHBUTTONS

Start push buttons shall be arranged as for stop push buttons with the exceptions that the contacts in the contact block shall be normally open and the front mounted operator shall be coloured GREEN and engraved with the word START.

9.18 RESET PUSHBUTTONS

Where required, reset push buttons shall be spring loaded mechanical devices, mounted immediately in front of the electrical overload.

The outer appearance of the housing for the reset push button shall be like the start or stop push buttons on the same panel. The rod attached to the push button shall be adjustable to suit the depth of the drive cubicle, as required.

The push button housing shall be of enough depth to provide proper support for the extension rod. The front mounted operator shall be coloured BLACK and engraved with the word RESET.

To achieve a pleasing layout of equipment on the door to the motor drive cubicle it may be necessary to adjust the position of the overload device within the cubicle.

9.19 EMERGENCY STOP PUSHBUTTONS

Emergency stop push buttons shall be arranged in similar fashion to the stop buttons.

The operating pushbutton however shall be at least 50mm in diameter and shall be knurled at the periphery.

The mushroom head shall be mechanically latched when it is pressed, to prevent the contacts, within the contact block, from re-closing.

To release the mechanical latch, and thus close the contacts, the operator shall be required to rotate the push button head through at least 60°.

9.20 NAME PLATES AND LABELS

Each component of electrical apparatus installed under this Contract shall be properly and unambiguously labelled.

Components on/in a distribution board shall be individually labelled, the compartments in which these components are mounted shall be labelled as an entity.

The labels on the outside of each compartment shall be operator orientated, whilst the labels inside the various compartments shall be technician orientated and shall be worded/numbered as per the wiring diagram for the respective cubicle/compartment.

All labels shall be secured to the outside and inside of distribution boards with machine screws. Self-threading screws or glue will not be permitted. The exception is equipment labels within the switchboard, which may be glued only. All screw fixed labels shall be jig drilled to provide interchange ability between compartments.

All notices and labels for warning purposes or indicating dangerous conditions shall be in English, Afrikaans and IsiXhosa.

General operating and identification notices and labels shall be in English only.

Labels shall have black letters on a white background for standard labels or white letters on a red background for caution, warning or danger labels.

Each label shall comprise a high-quality plastic tri-laminate and the wording shall be engraved through the outer layer to expose the colour of the centre layer. All engraving shall have sharp, clearly defined edges.

Labels and character sizes shall be commensurate with the size of article being labelled, with the proviso that where a range of label sizes would thus occur on a panel, the labels/character sizes shall be of a uniform average size.

9.21 LABELING OF DISTRIBUTION BOARD

The source of supply needs to be indicated for Circuit breakers.

Circuit breakers shall be numbered with suitable engraved two layer "Trefolite", black lettering on white.

The labels shall slide into an aluminium bracket as per attached drawing.

Each circuit breaker shall have a unique number and the number shall not be repeated on the same board. However, the numbering on each board shall start at 1.

Multi-phase breakers shall have a number for each pole.

Boards shall be numbered in "levels" e.g., the boards supplied by the transformer, mini substation or municipal kiosk shall be numbered MAIN DB1, MAIN DB2, etc.

The sub boards supplied by these boards shall be numbered SUB DB1.1, SUB DB1.2, SUB DB2.1, etc.

The numbers shall be repeated on a legend card that is displayed on the inside of the board. The card shall indicate the following:

- Circuit breaker number
- Type of circuit e.g., power points, lights, etc.
- Rooms numbers supplied
- Number of lights, power points, etc. in brackets

The proposed numbering shall be submitted to the Employer for approval prior to manufacturing of the labels. Labels that are manufactured incorrectly shall be for the contractor account.

9.22 SUB-DISTRIBUTION BOARDS

A separate earth continuity conductor shall be supplied between the earth busbar in each sub distribution board and the earth busbar in the Main Switchboard. The earth continuity conductor shall consist of insulated stranded copper conductor installed along the same routes as the supply cables or in the same conduit as the supply conductors.

10. EARTHING AND LIGHTNING PROTECTION

10.1 EARTHING

The earthing installation shall comply with the requirements of the latest revision of the Wiring Regulations (SANS 10142-1)

Earthing shall be undertaken as detailed on in the Project Specification.

The Neutral shall not be bonded to the Earth in the Motor Control Centre, but at the source of supply, namely the transformer.

All metallic cable support systems, handrails, ladders and access platforms shall be connected to the earthing system.

The resistance measured between the consumers earth terminal and any exposed conductive part of the installation or any other conductive part that needs to be bonded to the earth continuity conductor shall not be more than 0,2 ohms.

10.2 LIGHTNING PROTECTION

Lightning protection for this installation shall be limited to surge arrestors on the main board and suitable voltage protection on the instrumentation cables and equipment.

The surge arrestors shall be of an approval manufacture and shall bear the SANS mark of approval.

11. CABLE TRAYS

11.1 GENERAL

All proposed cable tray installations shall be neatly sketched and submitted to the Engineer for approval before any cable tray work is commenced. The sketch shall include principal dimensions and show the proposed cable tray routes.

Cable trays shall be wide enough to accommodate the cables required in terms of this contract plus 15% spare capacity for future additions.

11.2 MATERIAL AND MANUFACTURE

Cable tray shall be of the heavy-duty type manufactured from 2,0mm thick sheet steel and hot dipped galvanised after manufacture, designed for internal and external use.

Cable trays shall be plumb and true to line and shall be arranged either vertically or horizontally. Trays fixed to brickwork or concrete shall be mounted on 90° Z section spacer brackets, manufactured from 3 mm thick material, to space the back of the tray 30 mm from the structure. The brackets shall be full tray width and shall be provided along the cable tray route at approximately 500mm centres. Brackets shall be provided where cable trays terminate.

Each bracket shall be fixed to the wall with two 8mm anchor bolts entered at least 70mm into the wall whilst the tray shall be secured to each bracket with two 6mm galvanised steel set screws with nuts and washers.

A sample of the spacer brackets shall be submitted to the Engineer for approval, before proceeding with the manufacture of the remaining brackets.

Joints in the tray shall be kept to a minimum and shall only occur coincident with a spacer bracket position or cross brace position.

Bends and tees in the cable tray shall be factory made by the same manufacturer as the cable tray. Joints in the cable tray shall be kept to a minimum and shall be arranged to occur coincident with a support bracket.

Nylon washers may be employed to prevent galvanic reaction between galvanised steel and 3CR12 or 316 steel (for specialised installation), but careful consideration shall be given to ensure earthing continuity of all metallic items employed.

Should the environment be considered corrosive (for example Wastewater Treatment Plants or near the coast) the Engineer may call for all brackets, straps, cable tray, bolts, nuts, washers, etc. employed for the cable tray system to be manufactured from AISI 316 stainless steel.

11.3 CABLE POSITIONING AND FASTENING

All cables shall be neatly fastened to the tray with PVC cable straps at 300mm centres.

Where cable trays are run Vertically, Power Cables shall be installed at the bottom of the cable tray and instrumentation and signal cables at the top.

Where cable trays are run horizontally, Power Cables shall be installed closest to the supporting surface i.e. wall, and instrumentation cable to the front.

All cables shall be run and cleated in accordance with the wiring regulations and shall be run in the ground or on cable trays secured to concrete, brick or steel structures.

spaced not more than 1500mm apart.

12. CABLE SUPPORT SYSTEMS

12.1 GENERAL

Cable support system shall be wide enough to accommodate the cables specified in this contract plus 25% spare capacity for future expansion.

Pricing for cable support systems on the schedule of rates shall include all supplementary materials required to form a complete installation e.g. mounting bolts and nuts, brackets, threaded rods, chemical or mechanical anchors, "Unistrut" (equal and approved), canter lever arms, T-pieces, risers, droppers, horizontal bends, 4 way cross overs, "Clip-On" support channels, joiner or splice sets and hold down saddles etc.

12.2 MATERIAL AND MANUFACTURE

Cable support system shall be of the heavy-duty type manufactured from mild steel and hot dipped galvanized after manufacture, designed for internal and external use.

Should the environment be considered corrosive the Employer may call for 316L stainless steel. The contractor shall confirm the type of material before ordering.

12.3 INSTALLATION

Cable support system shall be plumb and shall length wise be arranged either vertically or horizontally. Joints in the cable support system shall be kept to a minimum and shall be properly braced. Bends and tees shall be from the same manufacturer.

Cable support system fixed to brick or concrete work shall be mounted on "Unistrut" brackets manufactured from 2.5mm thick material. The brackets shall be the full width of the ladder and shall be spaced 500mm centres along the length of the tray. Brackets shall be provided where cable trays terminate. Each bracket shall be fixed to the brick or concrete work with two (2) 8mm bolts entered at least 70mm into the concrete. The tray shall be secured to each bracket with two (2) 6mm galvanized steel set screws with nuts and washers.

12.4 POWER SKIRTING

In general, three-compartment power skirting manufactured from high impact PVC is preferred.

The compartments shall be utilised for the following services:

Top compartment (80mm high)	Power cabling and socket outlets
Centre compartment (40mm high)	Computer services
Bottom compartment (40mm high)	Telephone services

All compartments of the skirting shall be approximately 35mm deep. All cover plates, end covers, elbows, bends and other fittings for the power skirting shall be provided from the same manufacturers range of equipment as the power skirting and shall match aesthetically and mechanically.

Flush mounted, round, conduit draw boxes shall be provided in the wall behind each compartment of the power skirting. A 50mm diameter hole shall be provided in the back of the top compartment and 40mm holes shall be provided in the back of the remaining compartments, at positions coincident with the flush mounted conduit boxes, to facilitate the drawing-in of cables and conductors.

Each compartment shall be provided with its own 25mm conduit and box. The conduit coupled to the power compartment shall be run to the respective distribution board (whilst the conduits coupled to each of the remaining two compartments shall be run in accordance with Schedule G.

13. LOW VOLTAGE CONTROL AND SIGNAL CABLES

13.1 GENERAL

All cables indicated on the drawings and schematics shall be designed and selected according to the loadings, generally as detailed in the Project Specification.

A maximum total voltage drops of 2,5% is allowed across the cable from the MCC to the motor terminals under running conditions.

All conductors used in the electrical installation shall be high conductivity, annealed copper with PVC insulation and shall comply with SANS 1507.

No joints will be permitted in any low voltage cable run, except where cable lengths exceed the drum length, without prior written acceptance by the Engineer. Any damaged cable shall be replaced by the Contractor at his own cost.

All cables shall be suitably rated.

13.2 CABLE ROUTES

Control and instrument cables for the project may be run on the same cable tray as the power cables but where electromagnetic interference may upset the control signals the necessary precautions regarding screening and physical separation shall be applied.

Cable routes indicated are merely indicative of the points to be connected. The Contractor shall ascertain whether that route is the most suitable and feasible. The contractor shall order the cable accordingly.

13.3 CABLE LENGTHS

Cable lengths indicated in the Project Specification are employed for voltage drop calculations only and shall not be used as a basis for re-measurement.

The onus is on the Electrical (Sub) contractor to adequately survey the site and measure and price the power and control cabling installation as an all-inclusive complete item.

Should a deviation be required due to unforeseen site conditions, the Schedule of Rates for the Electrical Installation shall be applicable to calculate the difference in cost for the installation of power and control cables, but only with the approval by the Engineer.

13.4 POWER AND INDICATION CABLES (1000/600 VOLT)

All power and indication cables shall be of the multi-core stranded soft drawn copper wire PVC insulated PVC bedded, steel wire armoured type with an overall PVC sheath (preferably black) and shall be manufactured and tested in accordance with SANS 1507:2014 for general purpose duty.

The colour of the cores shall be as follows:

Twin core: one red, and one black.

Three cores: one red, one white and one blue.

Four cores: one red, one white, one blue and one black.

13.5 INSTRUMENTATION CABLES (24V / 220V)

Instrumentation cable shall be constructed of multiple twisted pairs of insulated stranded copper wire, PVC insulated with an overall aluminium shield, extruded PVC inner jacket, served with steel wire armour with an extruded PVC outer jacket.

The nominal conductor resistance shall not exceed 3,5 ohms per 100 m at 20°C.

The complete cable shall withstand a dielectric test conductor to conductor and conductor to shield of 1 000 V dc for one minute.

The insulation resistance of each conductor shall be not less than 8 800 meg ohms/km for 1 minute at 500 V and 20°C, measured with the remaining conductors in the cable connected to the armouring.

The minimum core size shall be 1,5 mm².

All instrumentation and signal cables (excluding optical fibre cables) shall be installed separate from power cables.

13.6 PANEL WIRING (24V / 220V)

Further to the abovementioned Clause, all panel wiring shall be of the silicone-insulated type with stranded tinned copper conductors, with a minimum conductor size of 1 mm².

The colour of the conductors shall be as follows:

220V AC control Line	=> Brown
220V AC Neutral	=> Black
+24V DC	=> Orange
-24V DC	=> Violet or Purple

13.7 PLC WIRING

Further to the abovementioned Clause, all panel wiring shall be of the silicone-insulated type with stranded tinned copper conductors, with a minimum conductor size of 1 mm².

The colour of the conductors shall be as follows for Digital Signals:

PLC DIGITAL Inputs	=> Grey
PLC DIGITAL Outputs	=> Pink

The colour of the conductors shall be as follows for Analogue Signals:

PLC ANALOGUE Inputs	=> twisted pair Red/black
PLC ANALOGUE Outputs	=> twisted pair White/black

13.8 SPARE CORES IN ALL CABLES

All cables installed shall include for spare cores. The spare cores shall amount to 10% of the number of cores used, rounded up to the nearest whole core.

13.9 CABLE IDENTIFICATION

A suitable tag, onto which the appropriate cable identification number in accordance with the

Contractor's detailed cable schedule shall be stamped, shall be adequately secured just below the gland at the ends of each cable.

Where cables deviate from one route to another (e.g., at tee's, on cable trays or in

trenches) additional identification tags with numbers shall be fitted to each cable, within 500 mm of the point of deviation.

13.10 CABLE SCHEDULES

The Contractor shall submit to the Engineer a detailed schedule of all cables together with drawings showing cable routes (both underground and on cable trays) for approval prior to the commencement of laying such cables.

13.11 OPTICAL FIBRE CABLES

The optical fibres shall comply with SANS/IEC 60793 and the optical fibre cables shall comply with SANS/IEC 60794 and shall be installed in accordance with SANS/IEC 60794.

All cables or cable lengths shall be supplied along with Factory Test Certificates.

Cable ends shall be suitably made off / protected to avoid water ingress, damage etc. while in storage.

The cables shall be of the multimode type, suitable for direct burial in the ground.

A cable shall contain 12 fibres packaged in two tubes and the fibres shall be to the following specification:

core diameter	50 microns
cladding diameter	125 microns
primary acrylic buffer	250 microns diameter
category	A2
wavelength	850nm
attenuation	3dB/km maximum
bandwidth	400-600 MHz/km

The cables shall be constructed to the following specification:

- tubes shall not be filled with water blocking compound
- the cable core shall be filled with water blocking compound
- the cable shall be designed with enough strength members to meet installation and service conditions so that the fibres are not subjected to strain of more than the limits specified by the manufacturer
- a moisture barrier shall be provided by a metallic tape applied over the cable core with a longitudinal overlap and bonded to the sheath
- the inner sheath shall be made of polyethylene
- the cable shall be armoured with Corrugated Steel Tape (CST)
- the outer sheath shall be a seamless sheath made of UV-stabilizer weather-resistant polyethylene in accordance with Clause 22 of SANS/IEC 60708-1 (To be updated with latest Standard)
- the outer sheath shall be marked with the manufacturer's name and "Optical Fibre Cable" as a single line of marking at intervals not exceeding 1000mm
- optical elements and each fibre with a cable element shall be uniquely identified by colours.

Cables shall be subjected to the following tests in accordance with SANS/IEC 60794-1-2:

- tensile performance
- cable bend
- crush
- temperature cycling
- water penetration

In addition, compatibility with the installation conditions shall be demonstrated through the following tests:

- impact
- kink
- torsion
- sheath abrasion resistance

13.12 CABLE GLANDS

All cable glands shall be of the adjustable pattern to secure to the wire armouring of the cable and shall be manufactured from nickel-plated brass. All cable glands shall be fitted with waterproofing neoprene shrouds.

13.13 POWER CABLE TERMINATIONS

Power cable terminations, connections and joints shall be facilitated by means of the use of a portable hydraulic compression tool with pre-set automatic tamperproof hydraulic unloading bypass valve, the entire equipment being either bought from, hired, or approved by the Cable Manufacturer.

Approved lugs or ferrules shall be crimped to the cable cores in all cases. No other method of termination or joint shall be allowed.

Where aluminium and copper or brass is in intimate contact and especially where the joint so formed is current carrying, "Densal" jointing paste or other approved paste or treatment shall be used.

14. CABLE TRENCHES

The cable trenches shall be as per project specification to suit environment but shall generally be a minimum of 450 mm wide x 750 mm deep. The trenches shall contain no stone or sharp objects and shall be inspected by the Engineer prior to backfilling.

For this Subcontract, only three classes of material are considered, and all excavated material shall be classified according to the following:

Type (as measured) in this document	General Description	Formal Classification to SANS 1200:2014
Soft excavation	Excavation by pick and shovel in soft soil	Soft Excavation
Intermediate excavation	WILL NOT BE MEASURED	All excavations will be deemed either Soft or Hard
Hard rock excavation	Removal of material by blasting	Hard Rock excavation

The Contractor shall provide all cable trenches. The Contractor shall be responsible for any damage to any services which may exist on the site and shall cover all costs incurred for the repair of any services which are damaged during the trench excavations

Although a minimum cable trench width has been specified, the installation of two or more cables shall result in the Contractor engineering the actual cable trench width to ensure that all cables are not underrated.

Trenching that is to be undertaken within the existing MV substation shall be by hand and supervised by a competent person, approved by the Engineer. No trenching machines will be allowed within the Existing MV substation and MV equipment area.

The Client may assist with the identification of existing cables depending on availability of equipment. The onus lies on the Contractor to ensure that services have been adequately surveyed and recorded prior to excavation.

All backfill material shall have enough moisture content to allow for good compaction. Backfill material shall be laid in layers to a depth of 150mm and then compacted by a compaction machine, suitable for the work at hand. The contractor shall ensure that the cable bedding sand and backfill is of a good quality to ensure that the thermal resistivity of the ground is at least improved.

All trenching shall conform to the standard as laid down in SANS 10198.

The contractor shall also ensure that the cable trenches are always properly fenced off until the cables have been installed and the trenches backfilled.

Danger tape shall be installed as specified.

The cable trench shall be shored with timber boards where required to ensure safety to workers and the public and facilitate ease of installation.

All trenching shall be inspected by the Engineer prior to backfilling.

14.1 CABLE ROUTE MARKER

Cable route markers shall be installed every 50m in straight runs and at every change of direction. These shall be of concrete pyramid type, with engraved aluminium label as detailed on Drawing titled "Cable Route Marker".

15. FIELD INSTRUMENTATION

15.1 GENERAL

The specifications for equipment to be supplied are as detailed below and within the Project Specification.

The Contractor shall include for all cabling required ensuring operation of the equipment as described in the Project Specification.

15.2 ULTRASONIC LEVEL DETECTORS

Ultrasonic Level Sensors/Flow Meters shall be Endress Hauser FMU 90 and shall be of robust design.

(a) Generic

Ultrasonic level detection shall be by means of a transducer and separate transmitter, with the sensor powered via the transmitter. The sensors shall be mounted on suitably sized brackets of glass fibre reinforced construction, stainless steel or similar non-corrosive material directly over the medium being monitored. The sensor shall have a stainless-steel diaphragm and shall be equipped with an integral cable of 10m length,

with the complete unit of at least IP65 rating. The sensors shall be capable of measuring range as set out below.

The transmitter shall be of minimum IP65 rating, or alternately, housing in a protective enclosure providing this rating. The transmitter shall have a local display, which shall be visible with the protective housing closed, if provided.

The transmitter shall be capable of bi-directional communication via a Modbus Plus network with the programmable logic controller.

The unit shall conform to the following:

Power supply	: 230 V AC
Output	: Isolated 4-20 mA
	: Relay (discreet outputs) as detailed
Calibration	: Independent adjustments for zero and span
Accuracy	: 1% of span or better
Repeatability	: 0,2% of span
Resolution	: 0,1% of span or 2mm, whichever is greater
Dead band	: - < 0,2% of span
Ambient temperature effect	: < 0,5% of maximum span per 10°C change

15.3 FLOW METERS

The flowmeter casing shall be aluminium, the flow transmitter remote from the primary flow tube. The transmitter assembly shall be at least IP65 rating and suitable for operation with either a 24V DC or 230 V AC power.

The output of the flowmeters shall be 4-20mA and shall also include a pulsed signal. Preferred manufacturers are E+ H or Flowmetrix

16. UNINTERRUPTIBLE POWER SUPPLIES

16.1 GENERAL

A UPS shall be provided for each separate piece of equipment such as a SCADA computer or a PLC. Specific requirement are as detailed in the Project Specification.

The UPS shall include an alarm panel, serial connection to a SCADA server and adequate batteries for 30-min backup.

Critical alarms, warnings and readings shall be logged and displayed on all available user interfaces.

UPS SPECIFICATION

The UPS's shall be to the "RIELLO" Catalogue model Sentinel XR (or equal), comply with the following specification for high availability, high stability under varying supply and varying loads, or equivalent.

- | | |
|--------------------------|--|
| (a) Rated input voltage: | 230 V (+/-15%) at 50 Hz (+/-5%) single phase (Without having to supply a CVT line conditioner). |
| (b) Rated output: | 230 V (+/-1,5%) at 50 Hz, single phase voltage |
| (c) Inverter rating: | - Dynamic regulation at 100% load application / removal: - Transient Recovery + 5% recovering to 1% within 10 m sec.
LOSS of AC supply:
- No change.
Total harmonic distortion: - Better than 3% (Linear load). |

	Overload capacity:	- 120% (10 seconds).
(d) Power rating	Enough to power all equipment as specified including PLCs as well as the PLC Data Network equipment and fibre optic transceivers	
(e) Rated stored	Standard with 30 minutes range energy time	
(f) Interfaces	SCADA: Microprocessor serial interface (SNMP) Modbus TCP/IP open communication protocol card LCD Status display.	
(g) Preferred Equipment	Riello XR Online, double conversion Batteries for UPS to be 10-year long life units	

16.2 INSTALLATION

UPS output shall be cabled to equipment to which it shall be supply. If Plug Socket Outlets are required, these shall be 15A red top plugs (dedicated).

17. PROGRAMMABLE LOGIC CONTROLLERS (PLC's)

17.1 GENERAL

A standalone programmable logic controller (PLC) shall be provided for the control of the equipment as described in the "Control Philosophy" section of the Detailed Specification or the Project Specification.

Allowance shall be made within the PLC equipment supplied, for the future control of the entire existing and proposed plant, as described in the specification and as detailed with the Proposed Single Line Diagram as referred to in the Project Specification.

ALLEN BRADLEY programmable logic controllers shall be supplied and installed with single or double rack configurations. A separate Ethernet (10/100 - RJ45 - Modbus TCP) module shall be installed on the configuration rack when Ethernet Communications is used.

ALLEN BRADLEY programmable logic controllers shall be supplied and installed with multiple rack configurations and/or larger numbers of Remote IO or Distributed IO.

17.2 EQUIPMENT SPECIFICATION

Hardware shall be field-proven under similar conditions and shall be suitably protected against excessive temperature, electrical interface, input and output overvoltage or short-circuit, and loss of program memory.

The equipment supplied shall incorporate a non-volatile form of program memory, which does not rely on an internal or external source of power to retain program memory in the event of a loss of normal power.

The CPU and I/O modules of the PLC shall be supplied with 20% excess program memory and I/O capacity for initial operation of all specified process components. However, the specifications of the PLC shall allow for future expansion of up to 50% additional memory and I/O capacity.

The PLC system shall be of a modular design with the mounting racks for the central controller, extension racks, power supply cards, central processing units interface cards, I/O cards, etc. interchangeable between the various nodes.

It shall be possible to code cards and slots to prevent the incorrect card being inserted into a given slot. Alternatively, the controller shall employ interrogation software, which shall detect the insertion of an incorrect module and prevent controller operation if an

incorrect module is installed.

It shall be possible to change the modules without disturbing field wiring. Connection blocks shall plug into the modules and shall be coded, to prevent connection blocks being plugged into the wrong modules. All modules shall have surge protection, which meets the IEEE-472 or similar standard.

All inputs shall have LED status indication on the modules. A maximum of 32 inputs with a single neutral shall be provided per module.

Output modules shall be of the opto-electric switched solid-state relay (SSR) type. The module shall be able to withstand a peak load of 15A for one cycle and intermittent load of 9A for 3 cycles, per channel. For SSR type output modules, fuse terminals with blown fuse indicators shall be provided at the back of the PLC section of the board. Should the fuse fail to blow, then the fault shall only affect the switched output, and shall not affect the remaining outputs within the group. All outputs shall have LED indications.

For both the input and output modules, the LEDs shall give a true load – side indication to and from the field devices.

Analogue input modules shall be of the multiple input range type. This may be either by means of plug-in type measuring range cards or by dip-switch selection. The input resolution of the module shall be a minimum of 12 bits. All inputs shall be individually isolated. Input modules with LED indication for “Communication Active” and “Out of Range” are preferred. Where many analogue inputs with relatively slow changing values is required to be monitored, use may be made of analogue multiplexer modules. The multiplexer shall be compatible with the analogue input module and shall therefore be supplied by the same manufacturer. The input resolution of the multiplexer shall be 12 bits.

Analogue output modules need not necessarily be of the full multiple output range type. The output resolution shall be 12 bits. The outputs shall be electrically isolated from each other.

Output modules with “Communication Active” indicators are preferred. Galvanic isolation in the form of opto isolators shall be provided for all inputs and outputs and the driving logic of the modules.

The suppliers shall be permanently represented in Cape Town and shall guarantee the availability of local field service facilities and unit replacement ex-stock from the local depot, for one year after the completion of the defect's liability period.

17.3 PROGRAMMING AND SOFTWARE

The Contractor shall provide his own computer hardware for programming, testing and commissioning of PLC's. The Contractor may receive, free issue for the duration of the contract, copies of the abovementioned software that he may utilise to program the proposed PLC. This software is issued on the condition that it is only utilised for this contract, may not be copied in any form and shall be returned, complete, to this Administration upon practical completion of the contract, with all installed software removed from development and programming computers.

All PLC programs shall be stored on CD- ROMs, from which it shall be possible to download onto the PLC on site by means of a Notebook PC. “Master” and “Back-up” CD-ROMs of all programs shall be issued to the Employer after commissioning. In addition to the CD-ROMs, a hard copy (printout) of all software shall be provided with the manual.

No special passwords, dongles, or other protection shall be installed or copyrighted which may inhibit access to the software by Council's technical personnel.

17.4 DATA COMMUNICATION

The PLC shall be able to interface with the general plant equipment as well as a future SCADA network via a Modbus communications network.

If communication is required between PLC's this shall be achieved using "Ethernet" concept.

17.5 PLC INPUTS / OUTPUTS

Although an Input / Output (I/O) schedule may be provided in the document, this indicates the minimum signals to be accommodated. The onus is on the Tenderer to study the proposed control of the philosophy and thus determine the precise I/O requirements and provide the necessary I/O's with spare allowance as per the requirements set out in the tender document.

17.6 REMOTE DIAGNOSIS AND PROGRAMMING FACILITY

All switchgear and Motor Control Centres which are equipped with a PLC for control purposes, will be provided with a suitable GPRS Modem connected to suitable hardware and software that allows remote access to the PLC.

This is required to allow remote fault finding, remote modifications to PLC program and to assist the Client should any malfunction occur. The Contractor is required to maintain this facility for a period of at least 5 years to enable continued backup service to the Client.

17.7 INSTALLATION

The PLC shall be installed in the PLC and Instrumentation panel in the MCC room (within a separate tier or within the marshalling section in the MCC is preferred). The I/O's shall be wired to terminal blocks in the marshalling section of the PLC panel.

The PLC and Instrumentation panel manufacturer shall adhere strictly to the recommended mounting and earthing requirements of the PLC manufacturer. The panel manufacturer shall confirm to the Engineer that the PLC will not operate at any time outside the environmental limits published by the manufacturer. The average maximum and minimum temperatures, the humidity as well as the heat dissipation of the PLC shall be taken into consideration when designing the compartment housing and apparatus.

If forced ventilation and/or panel heaters are required to provide the climate necessary for the PLC apparatus, then this shall be included in the panel design, together with the climate monitors to inform the operator in the control room when the equipment is operating in undesirable conditions. Detectors shall be provided and wired to an input card of the local PLC to alert the operator via the alarm panel if the "climate" drifts outside the pre-set values.

18. STARTING, SITE TESTING AND COMMISSIONING OF PLANT

The Contractor shall advise the Engineer when instructions may be given to the Building Contractor to execute any necessary screeding and finishings around the Works. Tenderers shall allow a reasonable period in their installation programme for this work to be done and no compensation for delay in the commencement of testing and commissioning shall accrue to the Contractor during such period.

18.1 PREPARATION

Installation work shall be complete and accepted by the Engineer prior to commissioning.

Before starting up any section of the Works, the Contractor shall make all necessary checks to ensure that the installation has been correctly carried out, that all ducts, pipework, tanks, etc., are clean, that all equipment is correctly aligned, lubricated and connected, and is in all respects ready to start with safety. The Contractor shall provide initial fill requirements, such as lubricating oil.

18.2 STARTING UP AND TESTING

The Contractor shall arrange for the Engineer to be present at initial start-up and for any electrical and control instrumentation sub-contractors to be present.

The Contractor shall start up and test each section of the Works. These tests shall be carried out to certify that the Works is operating in accordance with the requirements specified and must be witnessed by the Engineer. All necessary modifications and rectifications shall be carried out during this period.

Set points for equipment and process parameters which are required for the operation of control systems shall be confirmed and recorded.

18.3 SCADA SYSTEM

During commissioning of a new installation which incorporates SCADA as part of the control system, each control system alarm and interlock shall be tested, and the resulting alarm messages shall be modified by the Contractor to be acceptable to the Engineer.

A schedule of alarm messages and their full explanations shall be inserted in the Manual.

18.4 COMMISSIONING

When all tests have been completed to the satisfaction of the Engineer, the Works shall be commissioned. Unless the Engineer states otherwise, the complete plant, including all control functions and control systems shall be commissioned as a unit and the process performance requirements shall be achieved during normal operation.

Once the Works has been commissioned to the satisfaction of the Engineer, the operational acceptance period shall start and shall consist of a continuous period of operation free from trouble. Unless otherwise stated, this period shall be four weeks. During the operational acceptance period, the Contractor shall carry out all necessary servicing and any adjustments required. The plant staff will assist the Contractor in operating the Works during this period. The Contractor shall train the operational staff in the starting, operating and stopping of the Works, and shall train the maintenance staff on the routine maintenance requirements.

18.5 COMMISSIONING REPORT

A comprehensive commissioning test report, including the SCADA system commissioning procedure and schedule of alarm messages, shall be submitted by the Contractor prior to issue of the Certificate of Completion and shall be inserted in the Manual.

The contractor shall provide the following performance reports: for commissioning and tests as said above, a report after month of commissioning, report after three, six and 12 months of commissioning.

18.6 INSPECTION

At the end of the Trial Operation Period, an inspection shall be done by the Contractor and the Engineer for taking over the Works in terms of Clause 10 of the General Conditions of Contract.

Reactive and proactive maintenance performed shall be captured by the Contractor and confirmed by the Senior Engineer. This communication shall be done in the following format:

Date:
Plant name:
Location and GPS:
Equipment reference / what failed:
What is the damage:
Causes of the damage:
Repair time:

19. SPARES AND TOOLS

At completion of the work, before commissioning, the Contractor shall submit for approval by the Engineer, a full list of the spares that he intends providing.

Where specific spares are recommended by the supplier or manufacturer, these shall be included in full in the list for approval.

Generally, spares shall include the following:

- ◆ LV fuses: 1 spare for every 2 installed.
- ◆ Indicator lamps: 1 spare for every 10 installed.
- ◆ Lamp lenses: 3 spares for each colour installed
- ◆ Push buttons: 1 spare for every 3 or less of each colour and type installed.
- ◆ Lamps of luminaires: 1 spare for every 10 or less of each type installed.
- ◆ Relays : 1 spare for every 10 installed

Any special tools required to perform routine maintenance on any specific item of equipment shall be provided under this contract. Contractor or tenderer must provide list of recommended spares-refer datasheet of spares

20. EQUIPMENT APPROVAL

The Contractor shall submit detailed working drawings of all boxes, boards, panels, brackets, trays, etc. to the Engineer for approval prior to manufacture. The drawings shall be not less than A2 and shall clearly indicate the principal dimensions and at least two cross sections shall be provided. Door and cover plate details shall be given, together with details of hinges and catches. The work may not proceed until the drawings have been properly scrutinised and approved.

21. SCHEDULE OF EQUIPMENT

A complete list of fittings and other equipment intended for use on this Contract is to be submitted with the tender. This list shall contain manufacturers' names, catalogue numbers, etc. Where any item offered is not to specification, prior approval in writing shall be obtained from the Engineer before this can be offered.

Should any item supplied not comply with the specification, an alternative which meets the specification is to be approved by the Engineer and provided at no additional cost to the Contract.

22. EQUIPMENT TO BE SUPPLIED AND INSTALLED

The Engineer reserves the right to call for samples of the equipment offered, to inspect the workmanship as the work proceeds and to either accept or reject the equipment, or workmanship. The Engineer's approval of the design, materials and workmanship shall in no way reduce the Contractor's liability to provide a complete and proper working plant which is abreast with modern technology.

All such samples may be retained until completion of the Contract. All such samples shall have securely attached thereto labels designating the Contract by name and number (if any), the name of the Contractor and any further relevant information.

Unless where specified and agreed to IN WRITING, all equipment supplied by all parties shall be new and unused.

23. EVERYTHING NECESSARY

The Contractor will be deemed to have visited the site and to have satisfied himself as to the nature of the work, to have acquainted himself with any limitations which may be imposed upon him and to have provided for any additional costs which he may consider necessary for the proper completion of the work.

No claim will be recognised or considered after submission of price on the grounds of lack of knowledge of site conditions or limitations.

The installation shall include **everything necessary whether specified in detail or not** and shall be carried out in the best possible way to ensure a complete and first-class installation to the approval of the Engineer.

24. UNIFORMITY

All items of the same type of equipment shall where at all possible - be of the same make and type for each item throughout the installation, to ensure interchange ability and ease of maintenance.

25. RADIO, TELEVISION, COMPUTER AND COMPUTER SYSTEM INTERFERENCE

The Contractor shall allow for interference suppression components where required, to ensure that the electrical installation shall not cause interference to radio, television, staff location, computer and computer systems.

26. DELIVERY

The Contractor must co-ordinate the delivery dates for all items of equipment supplied by him to allow adequate time for installation, commissioning and testing prior to contract completion.

To this end, the Contractor must ensure that shop drawings are presented to the Engineer for approval timeously, and a programme of submission of such drawings must be approved by the Engineer as specified in the Conditions of Tender.

Documentary proof is to be supplied of the placing of all orders for equipment having a protracted delivery period. No substitution of specified items will be allowed due to the late placing of orders, and no delay claims in this regard will be entertained.

27. CONTRACTOR'S STAFF

The work shall be done by, or always be under the personal supervision of an installation electrician appointed in writing by the Contractor as the Responsible Person, in terms of the requirements of the Machinery and Occupational Safety Act. This person shall be available during working hours and shall be experienced in projects of the specified.

The Engineer may, if he deems fit, require that the Contractor removes or causes to be removed an employee of his from the specified premises by that person's incapability, appearance or any such reason which in the opinion of the Engineer, is valid.

At all times while on the specified premises, all artisan and labourer members of the Contractor's staff shall wear clothing adequately marked with the Contractor's name or acceptable identification.

28. VARIATIONS

For determining the cost of individual variations, the Tenderer shall quote scheduled rates which would be accepted as a basis for the evaluation of extras and omission.

29. INSPECTIONS, TESTS, MEETINGS AND COMMISSIONING

29.1 GENERAL

Should any tests or inspections be required outside of the Cape Metropole Area, the Tenderer shall allow in his Tender price for all costs (travel, accommodation, subsistence, etc.) for minimum of two persons to attend such tests or inspections.

The fact that the plant and equipment have satisfactorily passed any test made at the Subcontractor's works shall in no way lessen the responsibility of the Subcontractor to obtain the same results after it has been delivered and erected permanently on site.

29.2 TESTS

The Contractor shall notify the Engineer at least 2 weeks in advance, should his presence be required for inspections or witnessing of tests.

29.3 INSPECTIONS

Works acceptance (function) tests shall be performed, which shall be witnessed by the Engineer and the Client or the Engineer's representative.

If tests fail, the Contractor shall be required to perform such tests again. Should these tests require the Engineer to be present again, the Engineer's cost for time and travel shall be recovered from the Contractor at rates as set out by the South African Association of Consulting Engineers.

All test certificates required in terms of the current SANS regulations shall be furnished before the project can be completed. These shall also be bound into the operating and maintenance manuals.

29.4 MEETINGS

It is expected that the Contractor will be represented at every Project meeting during the contract. Meetings will be held in two formats, Site Meetings and Technical Meetings. The Site Meetings will be held monthly, and it is expected that the Subcontractor be represented by a senior person in the Subcontractor's firm, who can act on behalf of the Subcontractor.

At the Technical Meetings, held between the Site Meetings, the Subcontractor's representative may be a site or contracting foreman who is technically competent, having only to receive instructions on behalf of the Subcontractor. The Subcontractor shall make provision in the pricing of his Preliminary and General costs for these meetings.

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C3.4 Management

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C3.4 Management

C3.4 MANAGEMENT

C3.4.1 CONSTRUCTION PROGRAMME

C3.4.1.1 Format

The programme will be set up in collaboration with the Engineer:

In addition to the requirements of Sub-Clause 15 (3) of the General Conditions of Contract, the Contractors programme shall:

- i) be in a bar chart form
- ii) show the various activities related to a time-chart indicating the sequence of performing the works comprising the contract.
- iii) indicate critical path activities

C3.4.1.2 Allowances

The Contractors programme shall take the following into consideration:

- i) expected weather conditions
- ii) special non-working days as stipulated in the Contract Data

C3.4.2 PROCEDURES DURING CONSTRUCTION

The Contractor to supply, keep up to date and keep the following documents on site on a daily basis:

C3.4.2.1 A full set of the latest construction drawings to be on site permanently for use by the Engineer and others.

C3.4.2.2 The Contractor to supply and keep on site and A4 triplicate site instruction book.

C3.4.2.3 The Contractor to supply an A4 duplicate diary on site. The Contractor to keep daily diary with at least the following information.

- Weather condition
- Record of any accidents and detail
- Record of construction activities of the day
- Information of any strikes
- Any other relevant information

C3.4.3 SITE FACILITIES AVAILABLE

C3.4.3.1 Source of Water Supply

The Contractor is to make his own arrangements for the supply of water. Water is available from the municipality's waternetwork. The Municipality does not guarantee the sufficiency or continuity of the supply and no claims will be considered in this regard. The Contractor will be held responsible for any wastage of water due to negligence.

C3.4.3.2 Source of Power Supply

The Contractor is to make his own arrangement for the supply of power.

C3.4.3.3 Location of Camp and Depot

The Contractor must make his own arrangements for a campsite. The Contractor shall make his own arrangements for the accommodation of labour.

C3.4.3.4 Spoil Sites

No indiscriminate spoiling of material will be allowed. All unsuitable surplus material shall be removed from the site and to a suitable spoil site indicated by the Engineer.

C3.4.4 ABNORMAL RAINFALL

Refer to Contract Data – C1.2

C3.4.5 TIME RELATED ITEMS (Sub-Clause 8.2.2)

An approved extension of time (other than an extension of time granted in terms of Clause 12(8) of the Special Conditions of Contract) will entitle the Contractor to submit a claim for additional payment. Any such approved additional payment will be made for proven additional costs for each relevant time related item but will be limited to a maximum amount determined from the sum tendered for such item and from the designated operation, the period stated for the completion of the item or the tendered contract period, as applicable.

C3.4.6 PROJECTBOARD (Sub-Clause 3.2.1)

The Contractor must make provision for one project board as per the drawing bound in document.

C3.4.7 PROTECTION FROM STORMS AND FLOODS

The sum allowed for in the Bills of Quantities shall be deemed to be full compensation for any damage to the Works due to storms, rain, floods, stormwater or subsurface water.

Under no circumstances shall the Contractor be entitled to any additional payment in this regard. The Contractor shall accept full responsibility and costs to handle water from any source on the Site.

C3.4.8 EXISTING SERVICES

The Engineer will provide information regarding the location of the existing pipeline and connections, but the:

Engineer does not accept responsibility for the accuracy of this information. The Contractor shall make further investigations to determine the exact locality, size and depth of existing connections before commencing construction to ensure that no damage is done to any existing pipes or fittings.

The Contractor shall take all reasonable precautions to protect existing pipeline/services during construction and during relocation of such services.

Any pipe, cable, conduit or other services of any nature whatsoever indicated to the Contractor and subsequently damaged as a result of the Contractor's operations shall be repaired and reinstated forthwith by the Contractor or by the authority concerned, all at the expense of the Contractor and to the satisfaction of the Engineer.

Whenever services are encountered which interfere with the execution of the Works and which require be moving and relocating, the Contractor shall advise the Engineer who will determine the extent of the work, if any, to be undertaken by the Contractor in removing, relocating, and reinstating such services.

Any work required to be undertaken by the Contractor in the moving and relocation of services for which no provision is made in the contract documents, or for which no applicable tender rates exist, will be classed and paid for as "Daywork" as prescribed in the General Conditions of Contract.

The Contractor shall work in close co-operation with personnel of the Municipality controlling services, which have to be protected, removed or relocated. No undertaking can be given as to the exact time of commencement or of completion of the relocation, removal or protection of services, which have to be carried out, by the Board or controlling authorities themselves. The Contractor is to make allowance in his programme for this contingency.

Where services have to be removed or relocated or protected the Engineer will at the request of the Contractor, notify or negotiate with the Municipality or authorities controlling those services, but the Employer does not accept liability for any costs resulting from delays in the relocation, removal or protection of any service, or delays as a result of delays in negotiations. The sum allowed for in the Schedule of Quantities shall be deemed to be full compensation for the location and protection of existing services.

C3.4.9 ACCOMMODATION OF TRAFFIC AND PUBLIC ACCESS

During all his operations and when using his machinery, plant and equipment, the Contractor shall at all times take the necessary care to protect the public and to facilitate the traffic flow.

C3.4.10 SETTING OUT OF WORKS

All setting out required to carry out the work shall be undertaken by the Contractor. Setting out of the Works to be priced for in the item provided.

C3.4.11 SANITARY CONDITIONS

The Contractor shall ensure that, during the period of construction, sanitary conditions prevail on the site and surrounding areas. Unhygienic behaviour that may cause contamination of the works or the surrounding area is strictly prohibited.

C3.4.12 CONSTRUCTION IN CONFINED AREAS

It may be necessary for the Contractor to work within confined areas and no additional payment will be made for work done in restricted areas. The method of construction in these confined areas will depend largely on the Contractor's construction plant. However, the Contractor shall note that measurement and payment will be only in accordance with the specified cross-sections and dimensions, and that the tendered rates and amounts shall include full compensation for all special equipment and construction methods and for all difficulties encountered during working in confined areas and narrow widths, and at or around obstructions, and that no extra payment will be made nor will any claim for additional payment be considered in such cases.

C3.4.13 DENSITY TESTS / CONCRETE CUBES

The Contractor shall carry out his own density tests on each compacted layer and these tests shall be submitted to the Engineer for scrutiny and approval before commencing with the construction of the following item.

The Contractor also needs to do his own concrete cube tests, which is to be handed to the Engineer for scrutiny and approval. The Engineer may order that further, control tests are to be taken.

The Engineer may order that control tests be taken by his own or another independent laboratory. A provisional sum is provided in the Bills of Quantities to allow for the cost of control tests.

The sum allowed shall, however, be under the control of the Engineers and payment shall only be made to the Contractor on receipt of proof of expenses incurred by the contractor for the tests, i.e. payments to be made to an independent laboratory.

Should these control tests indicate failure to obtain the required standards, the cost of the tests shall be for the Contractor's account. Cub/Density tests carried out by the Contractor in the normal course of his work shall not be covered by this sum and shall be carried out at his own expense. The tendered rates in the Bills of Quantities shall be deemed full compensation for the testing of materials.

C3.4. 14 PRESSURE TESTS

The Contractor shall carry out pressure tests under the supervision of the Engineer on sections of the pipeline. The Contractor must supply all the necessary equipment to execute the testing of the pipeline, joints, connections and fittings on site. Full payment for installation of pipelines will only be processed after completion of pressure tests. The maximum length of pipe line that must be tested is 1.0km. All pipe sections to be tested at a pressure of at least 1,5 X the working pressure of the pipeline.

C3.4. 15 COMMUNITY LIAISON OFFICER (CLO)

The CLO official shall be identified by the Employer to act as a liaison person between the Contractor and the persons to be employed. The liaison officer must be appointed by a process of appointment and the job description is available from the Employer or the Employers Agent which must be communicated with him after appointment.

C3.4. 16 LABOUR INTENSIVE ACTIVITIES

GENERIC LABOUR-INTENSIVE SPECIFICATION

The Contractor's attention is drawn to the fact that it is an objective of the contract to maximise the labour content of certain operations or portions thereof. In this regard, where the specified work allows for a choice between mechanical or labour-enhanced means, the former shall generally be kept to the practical minimum.

The Contractor shall submit on a monthly basis, daily labour reports to the Engineer indicating the numbers of temporary personnel employed on the works and the activities on which they were engaged. The reporting shall be on EPWP formats that will be provided at the site handover meeting. These reports must be submitted with Monthly Payment Certificate Claims, otherwise payment will not be processed.

The normal rules and regulations in terms of the Labour Act must be adhered to. Minimum wages for the region must be paid to the labourers and formal Labour-contract documentation must be in place during the construction period.

The following activities must be executed with local labour:

- i) The normal handling, installation and testing of water pipes.
- ii) Placing and preparation of bedding and blanket materials in pipe trenches.
- iii) Compaction of bedding and blanket materials.
- iv) Building of all manholes and concrete structures.
- v) Final site clearance.

C3.4. 17 CONCRETE MARKERS

Concrete markers will be placed by the contractor along the pipelines at 500m intervals and at direction deviations. The markers must be precast or on site casted clearly in scripted with the letter 'w' (for water pipeline) at the top. The concrete must be reinforced with a minimum strength of 25 MPa and the marker must be installed at least 400mm underground and 600mm above ground.

C3.4. 18 EXCAVATIONS OF TRENCHES

The following rules must apply for the excavation of trenches:

- The pipe line route will be set out 4.0m from the existing pipe line where necessary.
- Excavations must be done without damaging the existing pipeline.
- The maximum allowable open trench length is 500m.
- The trenches must be excavated according to the prescribed grade line with deviations of not more than 3.5%.

C3.4.19 CLASSES OF EXCAVATION (Sub clause 3.1.2)

All material encountered in any excavations for any purpose including restricted excavation will be classified as follows:

- i) **Hard rock excavation**
Hard rock excavation shall be excavation in material (including boulders exceeding 0.15 cubic metres in individual volume) that cannot be efficiently removed without blasting or

without wedging and splitting or be in material, which cannot be excavated by a loader/backhoe or by a scraper without prior ripping.

ii) **Intermediate excavation**

This class of excavation will not be applicable or measured in this contract.

iii) **Soft excavation**

Soft excavation shall be all material not falling into the category of hard rock or intermediate excavation.

C3.4.20 MANHOLES

The rates for both chambers and manholes shall be measured as a unit and shall cover the cost of all items excluding pipe work. Included would be excavation, concrete work, brickwork (190mm bricks) and precast concrete slabs with manhole cover and frame.

C3.4.21 QUALITY CONTROLL BY THE ENGINEER

Except for the quality control measures that must be implied by the Contractor, the Engineer can arrange and executed his own quality control inspections. Invoices will be forwarded to Contractor for payment and to claim with a 7, 5% mark-up.

C3.4.22 HEALTH AND SAFETY PLAN

In compliance with the Construction Regulations the Contractor shall, after performing a risk assessment, prepare a health and safety plan for approval by the Employer.

The health and safety plan shall include, but not be limited to, the following:

- The safety management structure including the names of all designated persons such as the construction supervisor and any other competent persons;
- Safety method statements and procedures to be adopted to ensure compliance with the OHSA. Aspects to be dealt with shall include:
 - Public vehicular and pedestrian traffic accommodation measures;
 - Control of the movement of construction vehicles;
 - The storage and use of materials;
 - The use of tools, vehicles and plant;
 - Temporary support structures;
 - Dealing with working at height;
 - Environmental conditions and safety requirements in working hazardous materials including asbestos cement products;
 - Security, access, control and the exclusion of unauthorised persons.
- The provision and use of temporary services;
- Compliance with wayleaves, permissions and permits;
- Safety equipment, devices and protective clothing to be employed;
- Emergency procedures;
- Provision of welfare facilities;
- Induction and training;
- Provision and maintenance of the health and safety file and other documentation;

Arrangements for monitoring and control to ensure compliance with the safety plan.

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